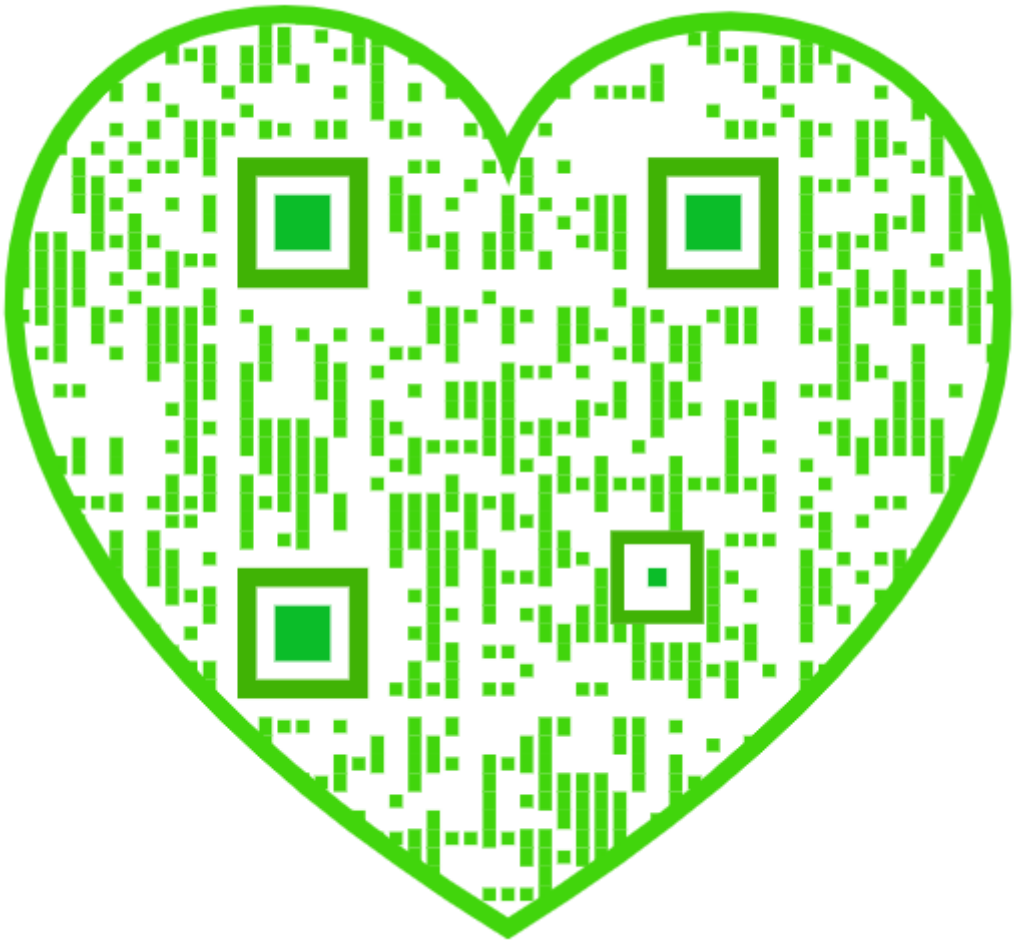

ARITHMETIC

BY

EUGENE HERZ

CERTIFIED PUBLIC ACCOUNTANT

AND

MARY G. BRANTS

CRITIC TEACHER, PARKER PRACTICE SCHOOL,
CHICAGO NORMAL COLLEGE

WITH THE EDITORIAL ASSISTANCE OF

GEORGE GAILEY CHAMBERS, Ph.D.

ASSISTANT PROFESSOR OF MATHEMATICS,
UNIVERSITY OF PENNSYLVANIA

PARTS III AND IV
ELEMENTARY LESSONS

THE JOHN C. WINSTON COMPANY
CHICAGO PHILADELPHIA TORONTO

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FOREWORD

Bearing in mind that a thorough knowledge of arithmetic is perhaps more frequently the cause of success in life than is any other single factor, one can hardly fail to realize how great is the responsibility which rests on those whose duty it is to provide for the child's education in this branch.

No book or series of books can possibly illustrate every use to which numbers can be put, but if the principles underlying their use are properly taught, the child can reason for himself the proper application of his knowledge to any given problem. Furthermore, as he must know how to solve a problem in the quickest and simplest manner, he must know not merely the various processes, but their construction as well; he must be able to analyze to such an extent that when a problem is presented to him, he can distinguish the facts which are relevant from those which are irrelevant, he can separate the known from the unknown, he can arrange the known in logical order for his processes, and he can use the shortest processes possible. An attempt to give the pupil this ability is the motive for this work.

The vehicle used to obtain the result is a series of progressive lessons, which, with ample practice, take the pupil step by step through the construction of each process to be learned, thus giving him the opportunity of following the teacher's explanation, and of referring to past lessons at any time. In this way the pupil who is slower to grasp new ideas than the average can keep up with his class, and every pupil can at all times refresh his memory on any points which he may have forgotten or which may have escaped him in the classroom, and which have so often been lost to him forever.

The time-saving methods used by the most expert arithmeticians are introduced as part of the routine work; thus, the child learns these without any special effort.

It is not intended that the lessons or definitions are to be learned verbatim, any more than it is intended that the examples given are to be memorized; both are there for the purpose of showing the pupil the reason for, and the application of, the processes, and the exercises are there to give him practice and to test his knowledge of what he has learned.

The exercises form a continuous review of what has been learned, but further review work is given at regular intervals.

The series consists of Three Books and Teacher's Manuals, as follows:

Primary Lessons.....Parts I and II. (Teacher's Manual only.)
Elementary Lessons....Parts III and IV. (With Manual for the Teacher.)
Intermediate Lessons...Parts V and VI. (With Manual for the Teacher.)
Advanced Lessons.....Parts VII and VIII. (With Manual for the Teacher.)

The first two parts are so arranged in the Teacher's Manual that the lessons and exercises can be given largely as games, play work, number stories in language work, etc., all used more or less incidentally, till the child is gradually prepared for work requiring an increasing degree of conscious effort.

The work contained in each of the eight parts is that which is usually taught in the corresponding grade, and it is recommended that this routine be followed. However, special provision has been made for such variations in the grading as are required in some localities, by means of a series of notes in the Teacher's Manuals which enable the teacher to follow either method with equal facility.

The authors wish to express their deep appreciation to Mr. E. C. Hinkle and Mr. J. R. Clark, both of the Department of Mathematics, Chicago Normal College, for their critical examination of the manuscript and their valuable suggestions for its improvement.

CONTENTS

PART III

LESSON NUMBER		PAGE
	COUNTING, READING AND WRITING NUMBERS 100 TO 999	
1.	THE FORMATION OF 100	1
2.	100 TO 199	4
3.	200 TO 999	6
	UNITED STATES MONEY	
4.	THE NUMBER OF CENTS IN EACH OF THE COINS	9
5.	EXPLAINING THE USE OF THE DOLLAR AND CENT SIGNS	11
	NUMBERS—NAMED AND NOT NAMED	
6.	EXPLAINING THE DIFFERENCE BETWEEN NUMBERS HAVING NAMES AND THOSE NOT HAVING NAMES	13
	ADDITION	
7.	WHAT ADDITION IS	14
8.	ADDITION WITHOUT CARRYING FIGURES	15
9.	CARRYING FROM UNITS' PLACE TO TENS' PLACE	16
10.	SHOWING THE PROCESS OF CARRYING FROM UNITS' PLACE TO TENS' PLACE	20
11.	SHOWING THE PROCESS OF CARRYING FROM TENS' PLACE TO HUNDREDS' PLACE	21
12.	COLUMN ADDITION	22
13.	ABRIDGED ADDITION	23
14.	ADDITION OF DOLLARS AND CENTS	26
	SUBTRACTION	
15.	WHAT SUBTRACTION IS	29
16.	SUBTRACTION NOT NECESSITATING CHANGING 1 OF ANY ORDER	31
17.	CHANGING 1 TEN INTO 10 UNITS	33
18.	SHOWING THE PROCESS OF CHANGING 1 TEN INTO 10 UNITS	36
19.	SHOWING THE PROCESS OF CHANGING 1 HUNDRED INTO 10 TENS	37
20.	ABRIDGED SUBTRACTION	39
21.	SUBTRACTION OF DOLLARS AND CENTS	41

CONTENTS

LESSON NUMBER		PAGE
	MULTIPLICATION AND DIVISION	
22.	WHAT MULTIPLICATION IS	43
23.	MULTIPLICATION TABLE OF 2'S	44
24.	MULTIPLICATION TABLE OF 3'S	46
25.	MULTIPLICATION TABLE OF 4'S	49
26.	MULTIPLICATION TABLE OF 5'S	51
27.	WHAT DIVISION IS	55
28.	DIVISION TABLE OF 2'S	57
29.	DIVISION TABLE OF 3'S	59
30.	DIVISION TABLE OF 4'S	62
31.	DIVISION TABLE OF 5'S	64
32.	LIQUID MEASURE	67
33.	DRY MEASURE	69
34.	MULTIPLICATION TABLE OF 6'S	72
35.	DIVISION TABLE OF 6'S	74
36.	TABLE USED IN COUNTING MERCHANDISE	76
37.	LINEAR MEASURE	78
38.	MULTIPLICATION TABLE OF 7'S	80
39.	DIVISION TABLE OF 7'S	82
40.	AVOIRDUPOIS WEIGHT	85
41.	MULTIPLICATION TABLE OF 8'S	88
42.	DIVISION TABLE OF 8'S	91
43.	ARABIC AND ROMAN NUMERALS	93
44.	MEASURING TIME	95
45.	TELLING TIME	96
46.	MULTIPLICATION TABLE OF 9'S	99
47.	DIVISION TABLE OF 9'S	102
	WRITTEN MULTIPLICATION	
48.	SINGLE-FIGURE MULTIPLIERS; NO CARRYING FIGURES	104
49.	SINGLE-FIGURE MULTIPLIERS; CARRYING FIGURES	106
50.	MULTIPLICATION OF DOLLARS AND CENTS	110
	WRITTEN DIVISION	
51.	THE FORMATION OF THE REMAINDER	112
52.	DIVIDENDS TO 99; NO CHANGING; NO REMAINDERS	117
53.	DIVIDENDS TO 99; CHANGING; REMAINDERS	120
54.	DIVIDENDS TO 999; NO CHANGING; NO REMAINDERS	125
55.	DIVIDENDS TO 999; CHANGING; REMAINDERS	127
56.	DIVISION OF DOLLARS AND CENTS	138

CONTENTS

PART IV

LESSON NUMBER		PAGE
	COUNTING, READING AND WRITING THOUSANDS AND MILLIONS	
1.	THE FORMATION OF THE PERIOD	1
2.	THE FORMATION OF EACH PLACE OF THE NEXT HIGHER ORDER	4
3.	READING AND WRITING THE NUMBERS	6
	ADDITION	
4.	THE ADDITION OF THOUSANDS AND MILLIONS	9
	SUBTRACTION	
5.	THE SUBTRACTION OF THOUSANDS AND MILLIONS	12
	MULTIPLICATION	
6.	THE MULTIPLICATION OF THOUSANDS AND MILLIONS	14
	DIVISION	
7.	THE DIVISION OF THOUSANDS AND MILLIONS	16
	MULTIPLICATION	
8.	MULTIPLIERS OF 10—ORAL	18
9.	MULTIPLIERS OF 10—WRITTEN	21
10.	MULTIPLES OF 10 AS MULTIPLIERS	24
11.	MULTIPLIERS OF 100, 1,000, ETC.	25
12.	MULTIPLES OF 100, 1,000, ETC., AS MULTIPLIERS	27
13.	TWO PARTIAL PRODUCTS	28
14.	THREE OR MORE PARTIAL PRODUCTS	31
15.	PARTIAL PRODUCTS WHEN THERE ARE CIPHERS IN THE NUMBERS	33
	DIVISION	
16.	DIVISORS OF 10—ORAL	37
17.	DIVISORS OF 100, 1,000, ETC.—ORAL	40
18.	WHEN THE DIVISOR AND DIVIDEND BOTH END WITH ONE OR MORE CIPHERS	41

CONTENTS

LESSON NUMBER		PAGE
19.	When There Are More Ciphers in the Ending of the Divisor than There Are in the Ending of the Dividend	44
	Long Division	
20.	Long Division and Short Division Compared	46
21.	When the Divisor Is Greater than the First Figure of the Dividend	48
22.	When the Dividend Contains Ciphers	50
23.	Divisors Containing Two Figures	51
24.	When the Two-Figure Divisor Is Greater than the First Two Figures of the Dividend	53
25.	Approximating the Number of Times that the Divisor Is Contained in Each Partial Dividend	55
26.	Writing 0 in the Quotient When the Divisor Is Greater than Any Partial Dividend	57
27.	Divisors Containing Three or More Figures	59
28.	Divisors Containing Ciphers	62
	Addition	
29.	Grouping of Tens	70
	Roman Numerals	
30.	Expressing Numbers in Roman Numerals	72
	Temperature	
31.	The Thermometer	77
	United States Money	
32.	Table of United States Money	79
	Multiplication and Division	
33.	Multiplication Table of 11's	81
34.	Division Table of 11's	84
35.	Multiplication Table of 12's	86
36.	Division Table of 12's	89
37.	11 or 12 as Multiplier or Divisor	92
38.	11 or 12 as Partial Multipliers	93
	Addition	
39.	Grouping Numbers by Using the Syllable "Teen"	95

CONTENTS

LESSON NUMBER — PAGE

Square Measure

40. Explaining the Difference Between One and Two Dimensions 96
41. Angles, Squares, and Oblongs 98
42. Square Measure 104
43. Dividing Area to Find Length or Width 106

Addition

44. Grouping the Number Following Partial Sums Expressed in Even Tens 111

Average

45. How to Find the Average 112

Buying and Selling

46. Sales-Slips or Bills 114

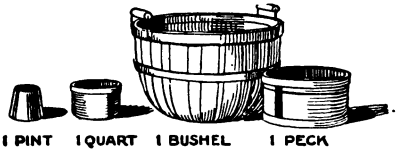
Definitions of the Terms Used in Parts I to IV, Inclusive .. 120

Abbreviations and Signs Used in Parts I to IV, Inclusive .. 125

Tables of Weights and Measures

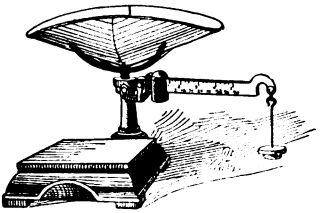
(For Ready Reference)

Dry Measure



2 pints (pt.) ..... = 1 quart (qt.)
8 quarts ..... = 1 peck (pk.)
4 pecks ..... = 1 bushel (bu.)

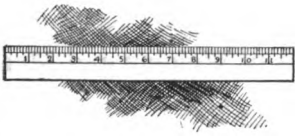
Avoirdupois Weight



16 ounces (oz.) ..... = 1 pound (lb.)
100 pounds ..... = 1 hundredweight (cwt.)
20 hundredweight ..... = 1 ton (T.)
2,000 pounds ..... = 1 short ton
2,240 pounds ..... = 1 long ton (used at mines and U. S. Custom House)

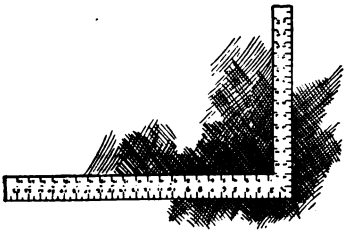
TABLES OF WEIGHTS AND MEASURES

Linear Measure



12	inches (in.)	= 1 foot (ft.)
3	feet	= 1 yard (yd.)
$5\frac{1}{2}$	yards	= 1 rod (rd.)
320	rods	= 1 mile (mi.)
1,760	yards	= 1 mile
5,280	feet	= 1 mile
6	feet	= 1 fathom (used in measuring the depth of water)

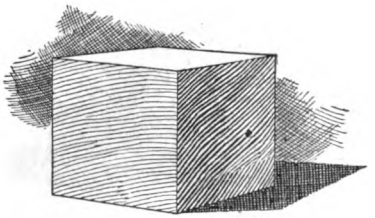
Square Measure



144	square inches (sq. in.)	= 1 square foot (sq. ft.)
9	square feet	= 1 square yard (sq. yd.)
$30\frac{1}{4}$	square yards	= 1 square rod (sq. rd.)
160	square rods	= 1 acre (A.)
640	acres	= 1 square mile (sq. mi.)
640	acres	= 1 section (sec.)
100	square feet	= 1 square (sq.)

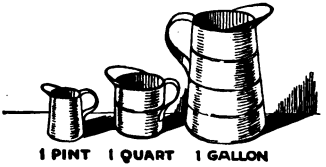
TABLES OF WEIGHTS AND MEASURES

Cubic Measure.



1,728 cubic inches (cu. in.)... = 1 cubic foot (cu. ft.)
27 cubic feet..... = 1 cubic yard (cu. yd.)
128 cubic feet..... = 1 cord (cd.)
1 gallon contains 231 cubic inches.
1 bushel contains 2,150.42 cubic inches or $1\frac{1}{4}$ cu. ft. (nearly).
1 cubic foot of water contains $7\frac{1}{2}$ gallons and weighs $62\frac{1}{2}$ pounds.

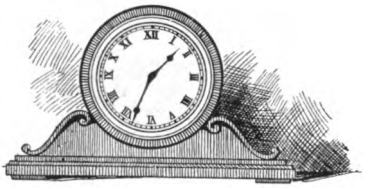
Liquid Measure



4 gills (gi.)..... = 1 pint (pt.)
2 pints..... = 1 quart (qt.)
4 quarts..... = 1 gallon (gal.)
$31\frac{1}{2}$ gallons..... = 1 barrel (bbl.)
2 barrels..... = 1 hogshead (hhd.)

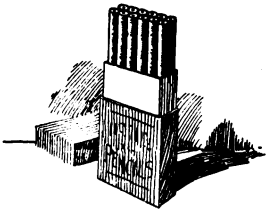
TABLES OF WEIGHTS AND MEASURES

Time Measure



60 seconds (sec.)	=	1 minute (min.)
60 minutes	=	1 hour (hr.)
24 hours	=	1 day (da.)
7 days	=	1 week (wk.)
28, 29, 30, 31 days	=	1 month (mo.)
12 months	=	1 year (yr.)
365 days	=	1 common year
366 days	=	1 leap year
100 years	=	1 century

Table Used in Counting Merchandise



12 things	=	1 dozen (doz.)
12 dozen	=	1 gross (gr.)
12 gross	=	1 great gross (gt. gr.)

ARITHMETIC

PART III

ELEMENTARY LESSONS

ELEMENTARY LESSONS

PART III

COUNTING, READING AND WRITING NUMBERS 100 TO 999

LESSON 1

The Formation of One Hundred

counting to ninety-nine, we use the figures 1, 2, 5, 6, 7, 8, 9, first in units' place with no tens to the numbers to 9, and then we use them and the r combined with 1, 2, 3, 4, 5, 6, 7, 8, or 9 tens ow the numbers from 10 to 99; therefore, 99 is rgest number which can be shown by using only and tens' places.

u know that 30 comes next after 29 because 29 ins 2 tens and 9 units and when 1 unit is added it makes another ten which we add to the had, making 3 tens and 0 units, or 30.

w, when we wish to show the next number after hat is done? 1 unit added to 9 units gives us 1 be added to the 9 tens we had, making 10 tens hundred and 0 tens; therefore, the next number 99 is 100 which is called "one hundred" and is n in three places—units' place on the right, place in the middle, and a new place called reds' place on the left. Starting from the right ad ng toward the left, units' place is the first

place just as before, tens' place is the second place just as before, and hundreds' place is the third place.

1 hundred is the same as 10 tens or 100 units as each of these numbers is written by using the figure 1 followed by two 0's, as follows:

Hundreds	Tens	Units	
1	0	0	One Hundred
	10	0	One Hundred
		100	One Hundred

Exercise 1—Oral.

1. What is the largest number which can be written by using only units' place?
2. What is the next higher number after 9 and how is it written?
3. In what place is the figure 1 of the number 10 written?
4. In what place is the figure 0 of the number 10 written?
5. How many tens are there in 10?
6. What are two tens called? What are four tens called?

7. What are five tens called? Six tens? Seven tens? Eight tens? Nine tens?
8. How many tens and how many units in:

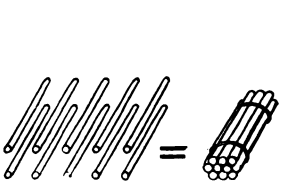
Forty-seven.	Sixteen.	Ninety-nine.
Sixty-three.	Eighty-two.	Twenty-one.
Thirty-nine.	Fifty-eight.	Eighty-eight.
Twenty-four.	Ninety.	Eighteen.

9. What is the largest number which can be written by using only units' place and tens' place?
10. Count from 9 to 39. Count from 39 to 69. Count from 69 to 99.

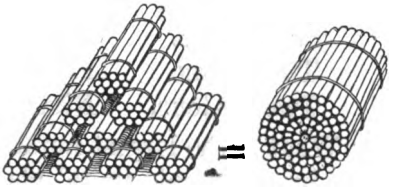
Exercise 2—Oral.

1. Why is the number next after 49 written 50?
2. How many tens and how many units in 49? In 50?
3. What is the number after 99? How is it written?
4. How many tens in one hundred? How many units in one hundred?
5. In writing one hundred, how many places are used? Write it on the board.
6. Starting from the right and reading toward the left, what is the name of the first place? Of the second place? Of the third place?
7. In writing one hundred, what figure is written in hundreds' place? What figure is written in tens' place? What figure is written in units' place? Show each of these on the board.
8. What are ten tens called? Show ten tens in 100.
9. What are one hundred units called?
10. Why is the number which comes after 99 written 100?

11. Begin with 29 and give all the numbers to 50.
12. Begin with 49 and give all the numbers to 70.
13. Begin with 89 and give all the numbers to 100.



10 Units = 1 Ten.



10 Tens = 1 Hundred.

14. Count by 1's to 10.
15. Count by 10's to 100.

Lesson 2

One Hundred to One Hundred Ninety-Nine

With 1 hundred, we can again have any number of tens and units; therefore, the next number after 100 is 101 which is pronounced "One Hundred One" and means 1 hundred, 0 tens, 1 unit; next comes 102 which is pronounced "One Hundred Two" and so on to 199 which is pronounced "One Hundred Ninety-Nine."

You know that the 0 must be shown in tens' place in writing 101, 102, 103, 104, 105, 106, 107, 108, and 109 to tell us that there are no tens in these numbers, otherwise the units and tens would be thrown out of place and 101 would be confused with 11, 102 would be confused with 12, and so on; therefore, when any two-place number is written, two places must always be used, 0 being written in units' place when there are no units; and when any three-place number is written,

three places must always be used, 0 being written in tens' or units' place when there are no tens or units.

Exercise 3—Oral.

1. What is the name of the number which shows:

   1 hundred, 3 tens, 6 units.
   1 hundred, 0 tens, 1 unit.
   1 hundred, 4 tens, 4 units.
   1 hundred, 6 tens, 0 units.
   1 hundred, 9 tens, 9 units.
   1 hundred, 1 ten, 1 unit.

2. How many hundreds, tens and units are there in:

   One hundred twenty-eight.
   One hundred nineteen.
   One hundred ninety.
   One hundred forty-four.
   One hundred eight.
   One hundred eighteen.
   One hundred eighty.

3. Read these numbers:

100	118	151	180	124	105
103	120	157	181	131	109
197	126	162	184	159	160
111	133	169	190	162	155
114	140	177	199	107	123

4. Why must the 0 in tens' place be shown in numbers like 101, 104, 107, 109, and so on?
5. How many places are used in writing two-place numbers? Name them.

6. How many places are used in writing three-place numbers? Name them.
7. Must three places always be used in writing hundreds?
8. Read these numbers:

87	141	38	186	99	164
153	76	198	56	101	63

Lesson 3

Two Hundred to Nine Hundred Ninety-Nine

Just as we had from 0 to 9 units and from 0 to 9 tens, so we can have from 0 to 9 hundreds; and as 1 added to 99 equals 100, 1 added to 199 must equal 200 and so on to 999 which is pronounced "Nine Hundred Ninety-Nine."

The numbers you now have learned, shown in groups of hundreds are:

1 to 99 (One to Ninety-nine)
100 to 199 (One hundred to One hundred ninety-nine)
200 to 299 (Two hundred to Two hundred ninety-nine)
300 to 399 (Three hundred to Three hundred ninety-nine)
400 to 499 (Four hundred to Four hundred ninety-nine)
500 to 599 (Five hundred to Five hundred ninety-nine)
600 to 699 (Six hundred to Six hundred ninety-nine)
700 to 799 (Seven hundred to Seven hundred ninety-nine)
800 to 899 (Eight hundred to Eight hundred ninety-nine)
900 to 999 (Nine hundred to Nine hundred ninety-nine)

Exercise 4—Oral.

1. What is the name of the number which shows:

1 hundred, 6 tens, 4 units.
2 hundreds, 8 tens, 7 units.
3 hundreds, 0 tens, 2 units.
4 hundreds, 1 ten, 7 units.
5 hundreds, 9 tens, 1 unit.
6 hundreds, 4 tens, 0 units.
7 hundreds, 9 tens, 1 unit.
8 hundreds, 5 tens, 5 units.
9 hundreds, 0 tens, 0 units.

2. How many hundreds, tens and units are there in:

Four hundred sixteen.
Eight hundred forty-four.
Three hundred eighty-nine.
Five hundred four.
Two hundred sixty-nine.
Nine hundred ninety-one.
One hundred twenty-one.
Seven hundred thirteen.
Six hundred thirty.
Four hundred eleven.

3. Read these numbers:

167	234	456	345	567	678	789	890
123	245	365	576	687	798	809	132
246	357	468	579	796	980	534	645
519	428	649	753	631	974	753	732
426	537	648	759	860	869	647	425
908	714	534	666	702	634	821	910

Exercise 5—Written.

1. Write the following numbers:

Two hundred seventy-eight.
Four hundred eighteen.

Seven hundred ninety-one.
Five hundred sixteen.
Eight hundred forty-one.
One hundred ninety.
Three hundred seventy-six.
Five hundred eighty.
Nine hundred twelve.
Six hundred sixty.
Two hundred seventy-seven.
Four hundred nine.
Three hundred eight.
Five hundred eighty.
Two hundred.
Eight hundred ten.
Seven hundred one.
One hundred seventy-three.
Nine hundred twenty-nine.
Six hundred sixteen.

2. Write the words for the following numbers:

100	200	300	500	700	900
406	302	507	804	909	605
111	312	215	617	818	913
410	334	526	748	963	769
657	192	841	860	578	666

3. Write the figures for the following numbers when your teacher reads them to you:

719	540	311	745	902	679
30	300	809	913	720	89
624	204	41	90	909	510
814	345	907	318	480	908
660	516	806	720	50	500

UNITED STATES MONEY

Lesson 4

The Number of Cents in Each of the Coins

5 cents = 1 nickel.
10 cents = 1 dime.
25 cents = 1 quarter or quarter-dollar.
50 cents = 1 half-dollar.
100 cents = 1 dollar.

Exercise 6—Oral.

1. How many cents are there in each of the following:

1 nickel.
1 nickel and 3 cents.
1 nickel and 5 cents.
2 nickels.
1 dime.
1 dime and 4 cents.
1 dime and 5 cents.
3 nickels.
1 dime and 1 nickel.
1 dime, 1 nickel and 2 cents.
1 dime and 2 nickels.
4 nickels.

2 dimes.
2 dimes and 4 cents.
2 dimes and 1 nickel.
1 quarter.
1 quarter and 4 cents.
1 quarter and 1 nickel.
1 quarter, 1 nickel and 2 cents.
1 quarter and 1 dime.
1 quarter, 1 dime and 1 nickel.
1 quarter, 1 dime, 1 nickel and 4 cents.
1 quarter, 2 dimes and 1 cent.
1 quarter, 1 dime, 2 nickels and 4 cents.
2 quarters.
1 half-dollar.

2. How many cents in each part of Question 1, when 1 half-dollar is added?

Exercise 7—Oral.

1. Name the fewest coins you would need to pay the grocer:

4 cents.	25 cents.	50 cents.	75 cents.
5 cents.	28 cents.	53 cents.	78 cents.
9 cents.	30 cents.	55 cents.	80 cents.
10 cents.	33 cents.	56 cents.	84 cents.
11 cents.	35 cents.	60 cents.	85 cents.
12 cents.	38 cents.	64 cents.	86 cents.
15 cents.	40 cents.	65 cents.	90 cents.
18 cents.	42 cents.	69 cents.	92 cents.
20 cents.	43 cents.	70 cents.	95 cents.
23 cents.	45 cents.	73 cents.	99 cents.
24 cents.	48 cents.	74 cents.	100 cents.

LESSON 5

The Dollar and Cent Signs

¢ stands for cent or cents.
$ stands for dollar or dollars.

The sign ¢ which stands for cent or cents is always written after the number of cents, as 48¢, 37¢, 19¢, and so on.

The sign $ which stands for dollar or dollars is always written before the number of dollars, and a period is always written after the number of dollars, as $1. $3. $19. $37. and so on.

When there are dollars and cents in the same amount, the dollar sign $ is used and the cent sign ¢ is not used, as the period which follows the number of dollars separates them from the cents; therefore, $3.48 means 3 dollars and 48 cents; $18.94 means 18 dollars and 94 cents.

Exercise 8—Oral.

1. Read:

1¢	$1.	$2.31
3¢	$4.	$3.87
7¢	$8.	$4.95
24¢	$37.	$9.10
43¢	$94.	$10.01
59¢	$116.	$24.25
68¢	$124.	$37.46
72¢	$175.	$53.71
84¢	$186.	$78.44
93¢	$199.	$106.38

Exercise 9—Written.

1. Write:

14 cents.	11 dollars.	12 dollars and 8 cents.
32 cents.	8 dollars.	2 dollars and 4 cents.
87 cents.	19 dollars.	8 dollars and 11 cents.
46 cents.	46 dollars.	9 dollars and 18 cents.
93 cents.	38 dollars.	18 dollars and 9 cents.
86 cents.	28 dollars.	18 dollars and 90 cents.
99 cents.	31 dollars.	18 dollars and 0 cents.

2. Write the words for the following:

18¢	$100.	$8.10
30¢	$213.	$9.24
25¢	$324.	$10.75
40¢	$487.	$40.60
45¢	$500.	$85.15
50¢	$761.	$250.75
69¢	$840.	$433.13
75¢	$875.	$690.90
98¢	$901.	$775.05

3. Write the figures for the following when your teacher reads them to you:

15¢	$1.	$6.60
50¢	$5.	$8.75
25¢	$7.	$15.45
75¢	$9.	$25.98
63¢	$10.	$78.02
41¢	$25.	$97.10
18¢	$47.	$100.01
80¢	$50.	$220.20
66¢	$63.	$666.06

NUMBERS—NAMED AND NOT NAMED

LESSON 6

Explaining Their Use

Some numbers are without a name, as: 4, 8, 19, etc.

Some numbers are named, as: 5 boys, 8 cents, 10 horses, 6 books, 5 quarters, 7 roses, 3 halves.

Exercise 10—Oral.

1. Read the numbers that are named:
   8 marbles, 2 sleds, 6 mittens, 12, 8, 3 roses, 2, 54¢, 186, $3.00, 37 pencils, 87, 146 men, 2 lamps, 942.
2. Read the numbers that are not named.
3. Write three numbers without names on the board.
4. Write four numbers with names.

A number without the name of an object is called an "abstract number".

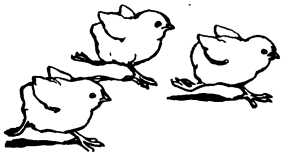
A number with the name of an object is called a "concrete number".

5. Pick out the abstract numbers:
   214 children, 76, 38 trees, $13.25, 95, 605, 487 apples, 14 days, 919.
6. Pick out the concrete numbers in Question 5.
7. Who can explain the difference between an abstract number and a concrete number?
8. Say five abstract numbers.
9. Say three concrete numbers.

ADDITION

LESSON 7

What Addition Is



6 (Addend)
+3 (Addend)
=9 (Sum)

Addition means "Uniting two or more numbers or quantities into one number or quantity which is called the sum or total."

The numbers to be added are called "addends."

The answer is called the "sum" or "total."

The sign of addition is (+) which is called "plus."

6	60	600
3	30	300
9	90	900

Units must always be added to units, tens to tens, and hundreds to hundreds.

Only like things can be added. Birds and more birds added give us a larger number of birds.

ADDITION

When units are added, the sum will be units; when tens are added, the sum will be tens; when hundreds are added, the sum will be hundreds.

Exercise 11—Oral.

1. Find the sums of the following groups of units:

8	6	5	7	5	6	7	4	6	5	4	5	4	3	4	3	3	2	2	1
1	2	3	2	4	3	1	4	1	2	5	1	2	3	1	2	1	2	1	1

2. Find the sums of the following groups of tens:

40	60	30	50	10	20	70	40	30	50	80	10
10	20	40	30	60	70	10	50	60	20	10	80

3. Find the sums of the following groups of hundreds:

100	200	700	600	500	400	800	200	300	300	200	100
300	400	100	300	400	300	100	700	600	500	600	800

LESSON 8

No Carrying Figures

723
165
888

Add the units in the example to get the units' figure of the sum; add the tens to get the tens' figure of the sum; add the hundreds to get the hundreds' figure of the sum; remember, add first the units, then the tens, and then the hundreds.

Always write units under units, tens under tens, and hundreds under hundreds, that you may add correctly.

Exercise 12—Oral.

1. Find the sum of each of the following examples:

18	26	35	47	55	66	77	84	96	85	74	65
1	2	3	2	4	3	1	4	1	2	3	1
54	43	34	23	13	24	53	61	72	84	93	90
2	3	1	2	6	5	6	7	6	4	5	9

2. Find the sum of each of the following examples:

16	28	23	37	18	62	86	71	60	46	72	12
23	41	66	62	51	31	13	26	31	53	24	37

3. Find the sum of each of the following examples:

108	237	346	871	923	646	531	486	631	521	872	863
1	2	3	7	5	3	8	2	5	7	6	3
368	872	125	136	684	135	646	329	178	643	732	801
31	26	43	52	13	43	32	50	21	43	37	92
683	762	251	316	846	315	466	293	718	436	327	108
106	226	343	632	143	672	421	505	271	362	560	791

LESSON 9

Carrying Figures

Find the sum of each of the following examples:

1	9	2	8	7	3	6	4	5	9	2	8	3	7	4	6	5
9	1	8	2	3	7	4	6	5	2	9	3	8	4	7	5	6
9	3	8	4	7	5	6	9	4	8	5	7	6	9	5	8	6
3	9	4	8	5	7	6	4	9	5	8	6	7	5	9	6	8

7	9	6	8	7	9	7	8	9	8	9	5	3	7	5	8	2
7	6	9	7	8	7	9	8	8	9	9	6	9	8	7	8	9

$$\begin{array}{r} {\scriptstyle 1} \\ 18 \\ +4 \\ \hline 22 \end{array}$$

When the sum of the units is more than 9, the tens in this sum must be "carried forward" and added to the other tens in the example.

$$\begin{array}{r} {\scriptstyle 1} \\ 130 \\ +80 \\ \hline 210 \end{array}$$

When the sum of the tens is more than 9, the hundreds in this sum must be "carried forward" and added to the other hundreds in the example.

Exercise 13—Oral.

1. Find the sum of each of the following examples:

11	69	49	59	39	89	49	19	39	29	52	53	44	45	76
9	2	3	4	5	6	7	8	9	1	9	9	9	9	8
37	28	32	48	68	38	58	68	28	57	27	87	17	77	63
8	6	9	5	4	3	2	3	4	5	6	7	8	9	8
25	48	68	38	74	76	66	33	48	27	36	48	56	75	83
6	7	8	9	6	7	8	7	4	5	4	6	7	8	9

2. How many addends did you use each time?

Exercise 14—Oral.

1. Say in your own words what addition means.
2. What is the answer of an example in addition called?
3. What is the name that is given to the numbers which are to be added?
4. In what place must the sum of two groups of units be written, when such sum is not greater than 9?
5. When the sum of two groups of units is greater than 9, what is done with the tens in the sum?
6. What is meant by "carrying 1" in the sum of two groups of units?
7. What is meant by "carrying 1" in the sum of two groups of tens?
8. Can the sum of two groups of tens be written in units' place? In what place must it be written?
9. Can the sum of two groups of hundreds be written in tens' place? In what place must it be written?
10. Starting from the left and reading toward the right, what are the names of the three places you know?
11. What does the sign (+) which is called "plus" mean?
12. What does the sign (=) which is called "equals" mean?
13. Why is it necessary to write units under units in addition examples?
14. Why is it necessary to write tens under tens in addition examples?

Exercise 15—Oral.

Grocer's Prices:

Sugar.....9 cents a pound.
Flour.....7 cents a pound.
Vinegar.....5 cents a pint.
Cabbage.....8 cents a head.
Milk.....6 cents a pint.

Butcher's Prices:

Beef.....32 cents a pound.
Lamb.....29 cents a pound.
Chicken.....27 cents a pound.
Lard.....28 cents a pound.
Mutton.....26 cents a pound.

1. How much would you have to pay for a pound of sugar and a pound of flour at the prices shown above? (Note:—This is an example in addition because it is necessary to unite the cost of a

pound of sugar and the cost of a pound of flour to find the total cost of both.)

2. How much would you have to pay for a pound of flour and a pint of vinegar?
3. How much for a pint of vinegar and a head of cabbage?
4. How much for a pint of milk and a head of cabbage?
5. How much for a pound of beef and a pound of sugar?
6. How much for a pound of flour and a pound of lamb?
7. How much for a pound of chicken and a head of cabbage?
8. How much for a pound of lard and a pint of milk?
9. How much for a pound of mutton and a pound of sugar?
10. How much for a pound of lard and a head of cabbage?

LESSON 10

Carrying From Units' Place to Tens' Place

The following example shows why we "carry" from units' place to tens' place:

EXAMPLE	WORKED
	1
18	18
+14	+14
	32

8 units + 4 units = 12 units or 1 ten and 2 units; write the 2 units in units' place and the 1 ten in tens' place above to be added to the other tens in the example.

	1		*1*		*1*		*1*
35	35	43	43	59	59	68	68
29	29	38	38	33	33	27	27
	64		81		92		95

Can you see the tens that were carried each time?

Exercise 16—Written.

1. Work the following examples in addition, showing how the carrying figures from the units are added to the tens:

23	45	56	78	66	87	54	35	28
28	46	34	19	25	4	19	36	63
79	65	29	47	58	75	28	47	77
12	16	62	15	29	16	66	46	17

Lesson 11

Carrying From Tens' Place to Hundreds' Place

The following example shows why we "carry" from tens' place to hundreds' place:

EXAMPLE	WORKED
	11
189	189
+134	+134
	323

9 units + 4 units = 13 units; write the 3 units in units' place and the 1 ten in tens' place above; 8 + 3 + 1 tens = 12 tens; write the 2 tens in tens' place and the 1 hundred in hundreds' place above; 1 + 1 + 1 hundreds = 3 hundreds; write the 3 hundreds in hundreds' place; therefore, 189 + 134 = 323.

Exercise 17—Written.

1. Work the following examples in addition, showing how the carrying figures from the units are added to the tens, and how the carrying figures from the tens are added to the hundreds:

167	258	369	583	692	854	746	637	483	399
254	366	482	288	209	78	164	284	259	388
685	317	214	888	205	219	678	676	647	623
288	596	196	32	196	381	183	234	186	289

Lesson 12

Column Addition

When several numbers are to be added, first add two of them and then add the others one at a time to the sum you already have; do not mention the addends at all, merely mention the sums as you go along—thus in adding 8 + 4 + 9 + 3, you say "12, 21, 24" because 8 + 4 = *12*, 12 + 9 = *21*, 21 + 3 = *24*.

Exercise 18—Oral.

1. Add:	7	4	9	6	6	3	9	7	6	7
	6	7	9	5	8	8	4	8	4	4
	9	9	3	6	5	9	8	8	3	3
	3	5	9	7	6	8	5	8	8	2
2. Add:	4	3	7	6	8	6	3	4	1	9
	8	4	6	5	7	2	4	3	9	6
	4	3	7	9	7	8	3	2	4	7
	5	9	2	6	8	7	6	1	7	5
	8	7	6	5	4	3	2	2	6	7
	5	6	8	7	8	5	4	6	3	7

LESSON 13

Abridged Addition

EXAMPLE 1	EXAMPLE 2
1	
18	18
14	14
32	32

When adding 18 + 14 as shown in Example 1, we have been writing the carrying figure 1 in tens' place so that you could see plainly why the 1 ten which is carried forward from units' place is added to the other tens in the example, but now that you understand this thoroughly, we can make the example much shorter by carrying this 1 ten to tens' place without writing it; so after this, 18 + 14 must be added as shown in Example 2, that is: 8 + 4 units = 12 units; write 2 in units' place and mentally carry 1 ten to tens' place; 1 + 1 + 1 tens = 3 tens; write 3 in tens' place; answer, 32.

Do not say any unnecessary words while adding; just say "12" as you add 8 + 4, write the figure 2 and carry the figure 1, then say "3" as you add 1 + 1 + 1, write the figure 3.

It makes no difference how many numbers there are in the example, the tens found in the sum of the units' column must always be added to the other tens in the example, and the hundreds found in the sum of the tens' column must always be added to the other hundreds in the example.

Study the next three examples very carefully.

EXAMPLE

28
36
42
87
193

Units added: 14, 16, 23; write 3 units and carry 2 tens;
Tens added: 4, 7, 11, 19; write 19.

EXAMPLE

36
47
39
63
47
232

Units added: 13, 22, 25, 32; write 2 units and carry 3 tens;
Tens added: 6, 10, 13, 19, 23; write 23.

EXAMPLE

176
238
469
883

Units added: 14, 23; write 3 units, carry 2 tens;
Tens added: 9, 12, 18; write 8 tens, carry 1 hundred;
Hundreds added: 2, 4, 8; write 8 hundreds.

Exercise 19—Written.

Copy and add:

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
17	26	37	43	79	83	56	48	39	41
15	37	48	39	14	8	34	45	28	19

11.	12.	13.	14.	15.	16.	17.	18.	19.	20.
118	136	364	478	346	429	531	438	328	247
344	247	229	119	238	265	259	257	438	315

21.	22.	23.	24.	25.	26.	27.	28.	29.	30.
182	364	297	384	437	293	389	742	368	435
239	246	328	167	285	508	244	199	555	265

Exercise 20—Written.

Copy and add:

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
28	38	46	34	3	46	31	38	40	38
37	63	88	73	84	87	43	72	20	17
46	84	92	86	4	31	82	84	10	38
87	46	39	2	10	29	93	38	9	4
29	29	47	21	3	44	47	71	6	63
42	87	25	8	90	54	63	93	8	2

Exercise 21—Written.

Copy and add:

1.	2.	3.	4.	5.
136	172	36	361	6
228	186	24	278	18
146	138	149	31	248
131	197	187	87	184
138	147	237	3	47
187	139	361	8	9

Write in columns and add:

6. 136 + 187 + 49 + 32 + 28 + 72.
7. 236 + 246 + 87 + 93 + 9 + 8.
8. 3 + 8 + 47 + 346 + 21 + 8.
9. 13 + 263 + 3 + 461 + 28 + 72.
10. 136 + 142 + 38 + 47 + 21 + 8.

LESSON 14

Dollars and Cents

$$\begin{array}{r} \$12.14 \\ 13.31 \\ \hline \$25.45 \end{array}$$

In adding cents and dollars to cents and dollars, remember that cents must be added to cents, and dollars must be added to dollars; therefore, be sure to write each period which separates cents from dollars under the period above it.

Exercise 22—Written.

Copy and add:

1.	2.	3.	4.	5.
\$13.71	\$14.36	\$18.74	\$19.34	\$15.67
14.29	12.68	14.39	10.96	3.33
6.	**7.**	**8.**	**9.**	**10.**
\$118.77	\$213.84	\$415.97	\$213.71	\$612.67
112.58	316.66	318.74	714.31	212.41
11.	**12.**	**13.**	**14.**	**15.**
\$36.87	\$14.32	\$112.67	\$242.63	\$398.67
12.46	36.87	246.82	138.71	87.42
8.72	23.41	38.46	239.29	3.18
3.46	2.31	87.23	0.63	27.64
2.81	3.86	14.62	6.87	0.08
4.63	0.87	19.38	38.47	4.12

Write in columns and add:

16. \$108.63 + \$237.46 + \$246.87 + \$138.56 + \$139.36 + \$128.62.
17. \$368.72 + \$12.38 + \$4.62 + \$0.87 + \$0.01 + \$0.10.
18. \$287.46 + \$346.28 + \$38.92 + \$84.63 + \$2.86 + \$3.41.
19. \$123.64 + \$3.87 + \$46.28 + \$138.46 + \$23.87 + \$1.12.

Exercise 23—Oral Review.

1. How many hundreds, tens and units are there in:
   419; 872; 304; 900; 30;
   746; 201; 3; 77; 582.
2. Read:
   614; 287; 346; 201; 800;
   574; 8; 877; 643; 87.
3. Find the sum of each of the following examples:

86	93	72	129	647
6	8	5	9	7

4. Are these numbers named or not named?
   79¢; 415; 47 chairs; 96 tables; 71.
5. There were 47 sheep in one pasture and 9 sheep in another pasture; how many were there in all?
6. A man bought a picture for 98¢ and picture wire for 10¢; how much did he spend in all?
7. Count by 2's from 50 to 80.
8. Count by 3's from 20 to 50.
9. Name the fewest coins you would need to pay:
   18¢; 37¢; 50¢; 84¢;
   24¢; 43¢; 70¢; 95¢;
   25¢; 49¢; 75¢; 100¢.

10. If you went to the store and bought 1 pound of beef for 34¢ and 1 pound of flour for 7¢, how much would you pay in all, and what are the fewest coins you would need?

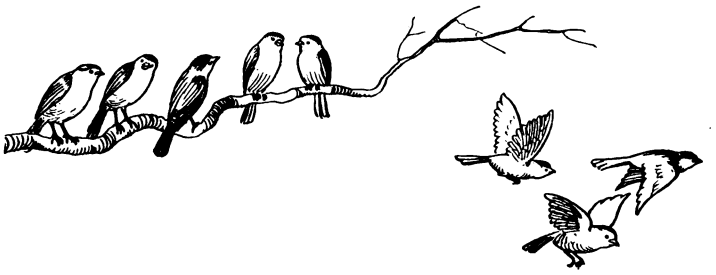
Exercise 24—Written Review.

1. Write in figures: Three hundred forty-six.
2. Write in figures: Seven hundred nine.
3. Write in figures: Six hundred thirty-two.
4. Write in figures: Two hundred thirteen dollars one cent.
5. Write in figures: Seven hundred sixty-three dollars ninety-four cents.
6. A school with six class-rooms had 32 children in Room 1, 27 children in Room 2, 36 children in Room 3, 25 children in Room 4, 31 children in Room 5 and 30 children in Room 6; how many children were there in this school?
7. $48 + 93 + 87 + 46 + 89 = ?$
8. A man on an automobile trip traveled 143 miles the first day, 178 miles the second day, 208 miles the third day and 193 miles the fourth day; how many miles did he travel in all?
9. A piano dealer sold four pianos, receiving $240.00, $250.00, $225.00, and $235.00; what was the total amount he received?
10. A cattle dealer shipped 5 cars of cattle to the stockyards; the cars contained 40, 43, 37, 39 and 45 heads of cattle; how many heads were there in all?

SUBTRACTION

LESSON 15

What Subtraction Is



8 (Minuend)
$-\underline{3}$ (Subtrahend)
$=5$ (Remainder or Difference)

Subtraction means "Taking one number or quantity from another number or quantity to find the remainder or difference."

In subtraction we have the sum of two numbers and we have one of the numbers, but must find the other number.

The number from which we subtract is called the "minuend."

The number which we subtract is called the "subtrahend."

The answer is called the "difference" or "remainder."

The sign of subtraction is (−) which is called "less" or "minus."

8	80	800
3	30	300
5	50	500

Unlike things cannot be subtracted.

When units are subtracted, the difference will be units; when tens are subtracted, the difference will be tens; when hundreds are subtracted, the difference will be hundreds.

In subtraction we find the number which, when added to the subtrahend, will equal the minuend, as $8 - 3 = 5$ because 5 is the only number which, when added to 3, gives a sum of 8; therefore, $8 - 3 = 5$ because $5 + 3 = 8$. Subtraction will be very easy for you if you use your knowledge of addition in this way. This method of subtraction is called the Austrian method.

Exercise 25—Oral.

1. Can you take 4 apples from 8 apples?
2. Can you subtract 4 apples from 6 pears?
3. Can unlike quantities be added or subtracted?
4. When units are subtracted from units, what will the difference be?
5. When tens are subtracted from tens, what will the difference be?
6. When hundreds are subtracted from hundreds, what will the difference be?
7. Name the number from which we subtract.

8. What is the number which we subtract, called?
9. What is the sign of subtraction called? How is it written?
10. How do you use your knowledge of addition to help you in subtraction?

Exercise 26—Oral.

1. Find the remainders of the following groups of units:

9	8	7	5	4	9	5	8	6	9
5	7	3	4	2	3	1	6	3	7

2. Find the remainders of the following groups of tens:

80	90	30	70	40	90	70	60	50	80
60	40	10	30	20	70	50	20	10	40

3. Read all the minuends; read all the subtrahends.
4. Find the remainders of the following groups of hundreds:

400	700	800	900	600	700	800	900	500	300
300	200	100	500	200	300	400	700	200	200

5. Read all the minuends; read all the subtrahends.

Lesson 16

No Changing

$$\begin{array}{r} 634 \\ 412 \\ \hline 222 \end{array}$$

Subtract the units in the example to find the units' figure of the remainder; subtract the tens to find the

tens' figure of the remainder; subtract the hundreds to find the hundreds' figure of the remainder; remember, subtract first the units, then the tens, and then the hundreds.

Exercise 27—Oral.

1. Find the remainder of each of the following examples:

19	26	39	46	59	68	76	89	97	86
3	4	7	5	3	8	4	6	2	5
74	38	49	27	32	67	79	88	95	19
2	7	5	3	2	7	4	3	4	7

2. Find the remainder of each of the following examples:

27	56	38	46	57	68	79	87	93	89
12	21	24	15	34	23	48	64	62	54

3. Find the remainder of each of the following examples:

174	286	399	448	556	698	749	888	649	967
3	5	2	7	3	6	8	8	3	5

4. Find the remainder of each of the following examples:

387	429	563	297	638	766	874	938	539	777
36	18	21	63	17	44	31	28	28	77

5. Find the remainder of each of the following examples:

786	439	872	568	739	863	956	748	632	561
343	128	731	246	108	731	243	517	211	410

SUBTRACTION

Lesson 17

Changing 1 Ten into 10 Units

Find the remainder or difference of each of the following examples:

10	13	14	15	16	12	11	13	14	15
1	5	7	9	8	6	9	6	8	7
18	17	16	14	13	12	10	11	15	13
9	8	7	5	8	9	6	7	8	9

1 13 2 3 −8 15	23 is changed into 1 ten and 13 units; 8 units from 1 ten and 13 units = 1 ten and 5 units, or 15.

When the units' figure of the subtrahend is larger than the units' figure of the minuend, "change" 1 of the tens in the minuend into 10 units and add these 10 units to the other units in the minuend, then subtract.

1 14 0 2 4 Ø −80 160	240 is changed into 1 hundred and 14 tens; 8 tens from 1 hundred and 14 tens = 1 hundred and 6 tens, or 160.

When the tens' figure of the subtrahend is larger than the tens' figure of the minuend, "change" 1 of the hundreds in the minuend into 10 tens and add these 10 tens to the other tens in the minuend, then subtract.

Exercise 28—Oral.

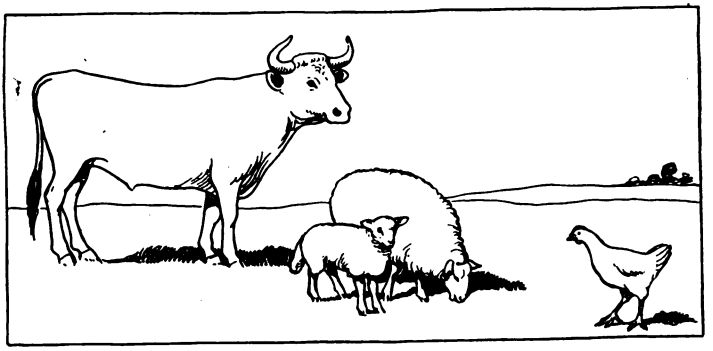
1. Find the remainder of each of the following examples:

26	37	42	56	87	93	84	26	31	82
7	8	5	8	9	6	7	8	5	4
35	86	92	31	47	28	33	61	68	72
8	9	4	5	9	9	6	5	8	4

Exercise 29—Oral.

1. Say in your own words what subtraction means.
2. What is the answer of an example in subtraction called?
3. What is the name that is given to the number from which we subtract?
4. What is the name that is given to the number which we subtract?
5. In what place must the difference between two groups of units be written? In what place must the difference between two groups of tens be written? In what place must the difference between two groups of hundreds be written?
6. When the number of units in the minuend is less than the number of units in the subtrahend, what must be done?
7. Why do we sometimes change 1 ten into 10 units?
8. Why do we sometimes change 1 hundred into 10 tens?
9. What does the sign (−) which is called "minus" mean?

Exercise 30—Oral.



Grocer's Prices:		Butcher's Prices:	
Sugar	9¢ a pound.	Beef	32¢ a pound.
Flour	7¢ a pound.	Lamb	29¢ a pound.
Vinegar	5¢ a pint.	Chicken	27¢ a pound.
Cabbage	8¢ a head.	Lard	28¢ a pound.
Milk	6¢ a pint.	Mutton	26¢ a pound.

1. What is the difference between the cost of a pound of beef and a pound of sugar? (Note:—This is an example in subtraction because here it is necessary to find the difference between two numbers.)
2. What is the difference between the cost of a pound of lard and a head of cabbage?
3. What is the difference between the cost of a pound of mutton and a pound of flour?
4. How much more must you pay for a pound of mutton than for a pint of milk?
5. How much more must you pay for a pound of chicken than for a pint of vinegar?

6. How much change would you get if you bought a pound of flour and gave the grocer 10¢? How much from 25¢? How much from 50¢?
7. How much change would you get if you bought a pint of vinegar and gave the grocer 5¢? How much from 10¢? How much from 25¢? How much from 50¢?
8. How much change would you get if you bought a pound of sugar and gave the grocer 10¢? How much from 25¢? How much from 50¢?
9. How much change would you get if you bought a pint of milk and gave the grocer 10¢? How much from 25¢? How much from 50¢?
10. How much change would you get if you bought a head of cabbage and gave the grocer 10¢? How much from 25¢? How much from 50¢?

LESSON 18.

How to Change 1 Ten into 10 Units

The principle covered by Lesson 17 is used in this way:

EXAMPLE	WORKED
	4 16
56	5 6
−39	−39
	17

9 units cannot be subtracted from 6 units, so 1 of the 5 tens is changed into 10 units and these 10 units are added to the 6 units making 16 units; 9 units from 16 units = 7 units; 3 tens from the other 4 of the 5 tens = 1 ten; therefore, 56 − 39 = 17.

	6 12		*4 13*		*7 14*		*3 10*
72	~~7~~2	53	~~5~~3	84	~~8~~4	40	~~4~~0
49	49	29	29	27	27	16	16
	23		24		57		24

Can you see the tens that were changed each time?

Exercise 31—Written.

1. Work the following examples in subtraction, showing how 1 of the tens in the minuend is changed into units:

34	25	43	56	63	78	84	95	87	64
19	16	27	29	34	49	38	47	39	46

Lesson 19

How to Change 1 Hundred into 10 Tens

When it is necessary to change 1 of the hundreds into tens, it is done in the same way as when 1 of the tens is changed into units:

EXAMPLE	WORKED	EXAMPLE	WORKED
	2 10 5		*3 15 6*
305	~~3~~05	456	~~4~~56
142	142	164	164
	163		292

Sometimes it is necessary to change 1 of the tens into units, and 1 of the hundreds into tens:

EXAMPLE	WORKED	EXAMPLE	WORKED
	4 13 17		*6 12 12*
547	~~5~~47	732	~~7~~32
258	258	378	378
	289		354

Sometimes changing 1 of the tens into units will make it necessary to change 1 of the hundreds into tens:

EXAMPLE	WORKED	EXAMPLE	WORKED
	2 13 15		3 15 13
345	3 4 5	463	4 6 3
147	147	267	267
	198		196

Sometimes you cannot change 1 of the tens into units until after you change 1 of the hundreds into tens:

EXAMPLE	WORKED	EXAMPLE	WORKED
	3 9 10		5 9 14
400	4 0 0	604	6 0 4
287	287	138	138
	113		466

Exercise 32—Written.

1. Work the following examples in subtraction, showing how 1 of the hundreds is changed into tens, and how 1 of the tens is changed into units:

463	354	936	547	475	863
274	168	249	358	197	299
357	646	535	638	741	253
159	448	237	439	248	156
805	608	403	305	507	702
108	209	107	106	209	408

LESSON 20

Abridged Subtraction

Now that you know how to change 1 of the tens into units and 1 of the hundreds into tens, the work can be made much shorter as follows:

565 156 409	6 units from 15 units = 9 units; 5 tens from 5 tens = 0 tens; 1 hundred from 5 hundreds = 4 hundreds; answer, 409; but do not say any unnecessary words, just say "9," "0," "4," as you write the figures.

Exercise 33—Written.

Copy and subtract:

1.	2.	3.	4.	5.	6.	7.
46	37	58	63	74	82	91
17	18	39	26	47	35	22

Write in columns and subtract:

8. 36 − 17; **9.** 41 − 23; **10.** 73 − 14; **11.** 52 − 29;
12. 94 − 36; **13.** 67 − 49; **14.** 83 − 54; **15.** 75 − 46.

Exercise 34—Written.

Copy and subtract:

1.	2.	3.	4.	5.	6.
354	276	468	557	638	746
136	147	219	328	129	438

Write in columns and subtract:

7. 864 − 226; **8.** 382 − 115; **9.** 564 − 427;
10. 671 − 338; **11.** 846 − 419; **12.** 791 − 433.

Exercise 35—Written.

Copy and subtract:

1.	2.	3.	4.	5.	6.
443	356	528	463	854	936
158	177	239	276	398	258

Write in columns and subtract:

7. 362 − 168; 8. 436 − 238; 9. 874 − 178;
10. 607 − 339; 11. 908 − 429; 12. 503 − 237.

Exercise 36—Oral.

1. What is the difference between 47 and 50? If you bought groceries worth 47¢ and gave the grocer a half-dollar, how much change would you get back? How many cents added to 47¢ equals 50¢?
2. How much change would you get from a dime if you spent: 2¢? 5¢? 7¢? 10¢?
3. How much change would you get from a dime and a nickel if you spent: 11¢? 13¢?
4. How much change would you get from two dimes if you spent: 11¢? 13¢? 15¢? 17¢? 19¢? 20¢?
5. How much change would you get from a dime and two nickels if you spent: 16¢? 18¢? 19¢? 20¢?
6. How much change would you get from a quarter if you spent: 3¢? 5¢? 10¢? 13¢? 15¢? 19¢? 20¢? 24¢?
7. How much change would you get from a half-dollar if you spent: 8¢? 12¢? 19¢? 25¢? 31¢? 40¢? 47¢?

8. How much change would you get from a half-dollar and a quarter if you spent: 53¢? 55¢? 59¢? 60¢? 64¢? 70¢? 75¢?
9. How much change would you get from a half-dollar, a quarter and a dime, if you spent: 76¢? 80¢? 83¢? 85¢?
10. How much change would you get from a dollar if you spent: 53¢? 28¢? 61¢? 30¢? 63¢? 75¢? 90¢?

Lesson 21

Dollars and Cents

\$6.23
2.13
\$4.10

In subtracting cents and dollars from cents and dollars, remember that cents must be subtracted from cents and dollars must be subtracted from dollars; therefore, write each period which separates cents from dollars under the period above it.

Exercise 37—Written.

Copy and subtract:

1.	2.	3.	4.	5.
\$8.24	\$7.36	\$15.38	\$126.31	\$314.31
3.46	2.41	12.14	12.36	112.18

6.	7.	8.	9.	10.
\$434.19	\$818.62	\$543.97	\$836.17	\$412.00
212.31	203.19	316.31	614.17	138.19

Write in columns and subtract:

11.	\$9.36 − \$4.62;	**12.**	\$10.28 − \$6.43;
13.	\$64.36 − \$19.36;	**14.**	\$136.87 − \$0.39;
15.	\$286.19 − \$248.99;	**16.**	\$836.47 − \$3.18;
17.	\$400.00 − \$136.71;	**18.**	\$394.02 − \$146.38;
19.	\$468.72 − \$138.99;	**20.**	\$386.47 − \$199.99.

21. Paul was saving money with which to buy a \$50. Liberty Bond; how much more did he need after he had saved \$31.25?

22. James saved \$151. while William saved \$39.; James saved how much more than William?

23. Archie had a bicycle which cost \$43.25; Vera had one which cost \$38.75; how much more expensive was Archie's than Vera's?

24. Mr. Smith bought a horse for \$175. and paid \$50. on it right away; how much had he still to pay?

25. Harry bought a fountain pen for \$1.75 and sold it for \$2.25; did he gain or lose? How much?

26. Mr. Smith paid \$175. for a horse and sold it for \$225.; did he gain or lose? How much?

27. Make a subtraction example using \$437. as the minuend and \$212. as the subtrahend.

28. If one painter asked \$427. for painting a house, and another painter said he would do it for \$385., how much could you save by having the second painter do the work?

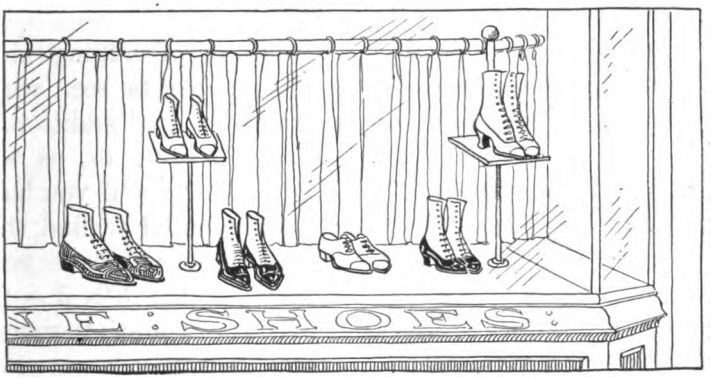
29. Mr. Brown started on a trip with \$125.; his railroad ticket cost \$53.75; how much had he left?

30. A grocer paid \$46.05 for apples and \$37.46 for potatoes; the apples cost how much more than the potatoes?

MULTIPLICATION AND DIVISION

LESSON 22

What Multiplication Is



3 (Multiplicand)
×2 (Multiplier)
=6 (Product)

Multiplication means "Finding a number or quantity by repeating another number or quantity a given number of times."

The number which is to be repeated is called the "multiplicand."

The number which shows how many times the multiplicand is to be repeated is called the "multiplier."

The answer is called the "product."

The sign of multiplication is ($\times$) which means "multiplied by" when the multiplier follows it, and "times" when the multiplier comes before it. "3 pairs of shoes $\times$ 2" is read: "Three pairs of shoes multiplied by two;" while "2 $\times$ 3 pairs of shoes" is read: "Two times three pairs of shoes."

"Nothing" or 0 multiplied by any number is still "nothing" or 0.

Multiplication is a short method of adding any number a given number of times, as can be seen very easily by using any simple example: In "addition," $3 + 3 + 3 = 9$; therefore, three 3's = 9; or, as we say in "multiplication," $3 \times 3 = 9$. Now, if you had to add $3 + 3 + 3$ every time you wanted to find the answer of 3×3, multiplication would not save you any time, but if you have learned that $3 \times 3 = 9$, then you will save the time that you would otherwise waste in making the addition, and the larger the numbers to be multiplied, the more time you save.

Lesson 23

Multiplication Table of 2's

Give the sum of each column:

1 two	2 two's	3 two's	4 two's	5 two's
2	2	2	2	2
	2	2	2	2
		2	2	2
			2	2
				2

6 two's	7 two's	8 two's	9 two's	10 two's
2	2	2	2	2
2	2	2	2	2
2	2	2	2	2
2	2	2	2	2
2	2	2	2	2
2	2	2	2	2
	2	2	2	2
		2	2	2
			2	2
				2

2 two's are 4. 6 two's are 12.
3 two's are 6. 7 two's are 14.
4 two's are 8. 8 two's are 16.
5 two's are 10. 9 two's are 18.
10 two's are 20.

Exercise 38—Oral.

1. Give the product of each of the following examples:

3 two's = ? 5 two's = ? 7 two's = ? 9 two's = ?
4 two's = ? 6 two's = ? 8 two's = ? 10 two's = ?
2 two's = ? 1 two = ?

2. Give the product of each of the following examples:

(Notice that in vertical multiplication the smaller number is written under the larger number.)

4	6	9	3	5	8	7	2	2	10
2	2	2	2	2	2	2	2	1	2
8									

Exercise 39—Oral.

1. At 2¢ each, what is the cost of:

   (These answers are found by multiplication, because it is necessary to repeat the cost of 1 article a given number of times to find the cost of several articles of the same price; as, 4 pencils at 2¢ each cost 2¢ × 4 or 8¢.)

   4 pencils? 6 newspapers?
   5 pens? 10 postage stamps?
   8 rulers? 7 writing pads?

2. How many shoes are there in 6 pairs of shoes?
3. How many boots are there in 10 pairs of boots?
4. How many gloves are there in 5 pairs of gloves?
5. How many knobs are there on 8 doors if each door has 2 knobs?
6. How many cushions are there on 4 chairs if each chair has 2 cushions?
7. If it is 2 miles from your house to the river, how far would it be if you lived nine times as far from the river?

LESSON 24

Multiplication Table of 3's

Give the sum of each column:

1 three	2 three's	3 three's	4 three's	5 three's
3	3	3	3	3
	3	3	3	3
		3	3	3
			3	3
				3

6 three's	7 three's	8 three's	9 three's	10 three's
3	3	3	3	3
3	3	3	3	3
3	3	3	3	3
3	3	3	3	3
3	3	3	3	3
3	3	3	3	3
	3	3	3	3
		3	3	3
			3	3
				3

2 three's are 6. 6 three's are 18.
3 three's are 9. 7 three's are 21.
4 three's are 12. 8 three's are 24.
5 three's are 15. 9 three's are 27.
10 three's are 30.

Exercise 40—Oral.

1. Give the product of each of the following examples:

3 three's = ?	8 three's = ?	4 three's = ?
6 three's = ?	5 three's = ?	7 three's = ?
10 three's = ?	9 three's = ?	2 three's = ?
	1 three = ?	

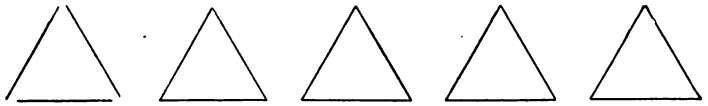
2. Give the product of each of the following examples:

6	4	9	8	7	10	5	3	3	3
3	3	3	3	3	3	3	3	2	1
18									

3. At 3¢ each, what is the cost of:

5 apples?	7 lemons?	10 eggs?
4 oranges?	6 tarts?	9 pears?

4. How many sides are there on 5 triangles if each triangle has 3 sides?



5. If 3 persons can ride in an automobile, how many persons can ride in 7 such automobiles?
6. If a book-case has 3 books on each shelf, how many books are there on 9 shelves?
7. If you are idle 3 minutes every day when you should be studying your lessons, how many minutes do you waste in 10 days? (Note:—Remember this little example.)
8. There are 3 feet in a yard; how many feet are there in 6 yards? In 8 yards?

Exercise 41—Oral.

As 2×3 gives us the same answer as 3×2, both answers being 6, we learn from this that the order in which the numbers in a multiplication example are used does not change the product.

1. What is the product of 2×4? What, then, is the product of 4×2?
2. 2×5 gives the same product as what other example?
3. Can you make a nice story for this example, $2 \times 3 = 6$, by giving the figure 2 a name? (This would be a good one: There were 2 clowns in each of 3 rings at a circus; how many clowns were there in all?) Now you try!

4. Now give the figure 3 a name and make another story for $2 \times 3 = 6$. Now give the figure 3 another name and try again.
5. Now make two stories for each of these examples by first giving one figure a name, then giving the other figure a name, and end each story by giving the correct product:

4	6	8	5	6	10
2	2	2	3	3	3

Lesson 25

Multiplication Table of 4's

Give the sum of each column:

1 four	2 four's	3 four's	4 four's	5 four's
4	4	4	4	4
	4	4	4	4
		4	4	4
			4	4
				4

6 four's	7 four's	8 four's	9 four's	10 four's
4	4	4	4	4
4	4	4	4	4
4	4	4	4	4
4	4	4	4	4
4	4	4	4	4
4	4	4	4	4
	4	4	4	4
		4	4	4
			4	4
				4

2 four's are 8. 6 four's are 24.
3 four's are 12. 7 four's are 28.
4 four's are 16. 8 four's are 32.
5 four's are 20. 9 four's are 36.
10 four's are 40.

Exercise 42—Oral.

1. Give the product of each of the following examples:

4 four's = ?	7 four's = ?	9 four's = ?
6 four's = ?	10 four's = ?	3 four's = ?
5 four's = ?	8 four's = ?	2 four's = ?
	1 four = ?	

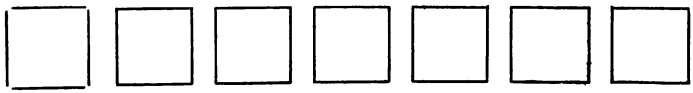
2. Give the product of each of the following examples:

7	5	9	10	6	4	8	4	4	4
4	4	4	4	4	4	4	2	3	1

3. At 4¢ each, what is the cost of:

7 rulers?	4 writing pads?
9 slates?	6 pencils?
8 penholders?	5 erasers?

4. If there are 4 chickens in each yard, how many chickens are there in 3 yards?
5. If each window has 4 panes of glass, how many panes are there in 9 windows?



6. A square has 4 corners; how many corners will you find on 7 squares? How many sides?

7. If each of 8 persons has $4.00, how much money have they in all?
8. If each table has 4 legs, how many legs are there on 5 tables?

Exercise 43—Oral.

1. You may now make two good problem stories for each example in the second set of Exercise 42.

LESSON 26

Multiplication Table of 5's

Give the sum of each column:

1 five	2 five's	3 five's	4 five's	5 five's
5	5	5	5	5
	5	5	5	5
		5	5	5
			5	5
				5

6 five's	7 five's	8 five's	9 five's	10 five's
5	5	5	5	5
5	5	5	5	5
5	5	5	5	5
5	5	5	5	5
5	5	5	5	5
5	5	5	5	5
	5	5	5	5
		5	5	5
			5	5
				5

2 five's are 10. 6 five's are 30.
3 five's are 15. 7 five's are 35.
4 five's are 20. 8 five's are 40.
5 five's are 25. 9 five's are 45.
10 five's are 50.

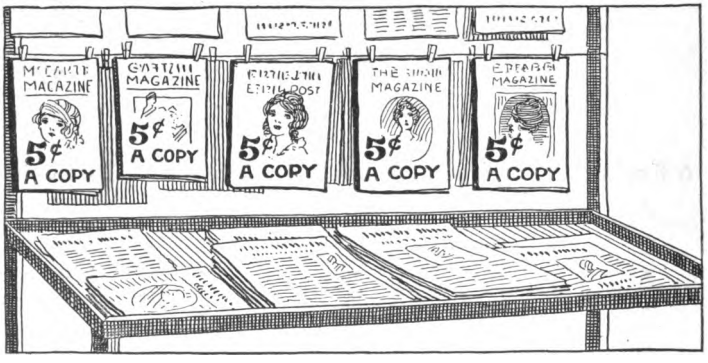
Exercise 44—Oral.

1. Give the product of each of the following examples:

3 five's = ? 4 five's = ? 9 five's = ?
7 five's = ? 10 five's = ? 6 five's = ?
5 five's = ? 8 five's = ? 2 five's = ?
1 five = ?

2. Give the product of each of the following examples:

8	9	5	10	7	6	5	5	5	5
5	5	5	5	5	5	3	4	2	1



3. What is the cost of the following @ 5¢ each:
The sign (@) *means "at."*

3 street-car rides? 5 magazines?
4 postage stamps? 10 cigars?
6 Sunday newspapers? 8 clay pipes?

4. If it takes you 5 minutes to walk to school, how many minutes do you spend in walking to and from school in 2 days?
5. If John is 5 years old and his father is 9 times as old, how old is John's father?
6. If you go to school 5 days every week, how many days do you go to school in 7 weeks?
7. If 8 boys went fishing and each boy caught 3 perch and 2 trout, how many fish did they catch in all?
8. If you saw 5 birds every minute, how many birds would you see in 5 minutes?

Exercise 45—Oral.

1. You may now make two good problem stories for each example in the second set of Exercise 44.

Exercise 46—Oral.

1. Say in your own words what multiplication means.
2. Say in your own words what the multiplicand is.
3. Say in your own words what the multiplier is.
4. In multiplication, what is the answer called?
5. What is the sign of multiplication?
6. Multiplication is a short method of what?
7. What does the sign (@) stand for?
8. In multiplication, what is the name of the number which is to be repeated?
9. In multiplication, what is the name of the number which shows how many times the other number is to be repeated?
10. In vertical multiplication, do we write the larger or the smaller number above the other?

11. When 0 is multiplied by any number, what is the answer?
12. Does changing the order of the numbers in a multiplication example change the product?

Exercise 47—Oral Review.

1. $73 + 8 = ?$ $94 + 9 = ?$ $136 + 5 = ?$ $246 + 4 = ?$ $397 + 6 = ?$
2. $76 - 7 = ?$ $83 - 6 = ?$ $141 - 9 = ?$ $248 - 9 = ?$ $577 - 8 = ?$
3. How much change would you get from a half-dollar, if you spent 9¢; 14¢; 25¢; 36¢; 41¢.
4. Say the multiplication table of 2's.
5. Say the multiplication table of 3's.
6. Say the multiplication table of 4's.
7. Say the multiplication table of 5's.
8. 3 five's = ? 9 four's = ? 10 three's = ? 8 four's = ? 7 five's = ?
9. How many cents are there in 5 nickels? In 9 nickels? In 7 nickels?
10. How many legs are there on 8 chairs? On 6 chairs? On 4 chairs?

Exercise 48—Written Review.

1. A builder received four wagon-loads of lumber containing 135, 276, 147, and 219 boards; how many boards did he receive in all?
2. David had 413 marbles and gave 176 of them to Ruben; how many had he left?
3. A man bought an automobile for $800.00 and paid $375.00 before he received it; how much had he still to pay?

4. 468 − 297 = ?
5. 439 + 162 = ?
6. Write in columns and add:
   $10.46, $113.52, $119.00, $304.00, $7.09.
7. 136 + 420 + 25 + 37 + 9 = ?
8. A man bought two horses, paying $60.50 for one, and $87.50 for the other; how much more did one cost than the other? What was the total cost of both?
9. William had $4.43; his father gave him 75¢; William then spent $2.85 for a pair of shoes; how much had he left?
10. A man who had $473.24 in the bank drew out $214.71; how much had he remaining in the bank?

Lesson 27

What Division Is

= 4 (Quotient) (Divisor) ÷ 2)8 (Dividend)

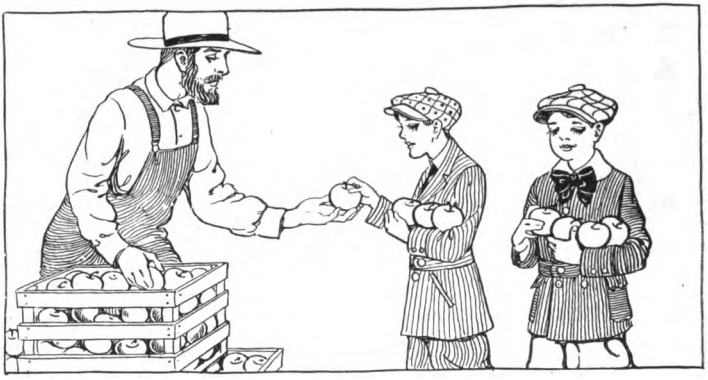
Division means "To find how many times one number is contained in another number," and "To find one of the equal parts of a number."

In division we know the product of two numbers and we know one of the numbers, but must find the other number.

The number which is to be divided or separated is called the "dividend."

The number which shows into how many equal parts the dividend is to be divided, or which shows the size

of the parts when the number of parts is to be found, is called the "divisor." The divisor is the number you divide by.



The answer is called the "quotient."

The sign of division is (÷) which means "divided by."

"Nothing" or 0 divided by any number gives "nothing" or 0. No number can be divided by 0.

Out of every multiplication problem, two division problems may arise, as this simple example will show:

Multiplication

At 2¢ each, what is the cost of 4 apples? Answer: 8¢, because 2¢ × 4 = 8¢.

Division

Number 1.

At 2¢ each, how many apples can be bought for 8¢? Answer: 4 apples, because 2¢ is contained in 8¢ four times.

(*Answers of this kind always show number of times.*)

Number 2.

If 4 apples cost 8¢, what is the cost of 1 apple? Answer: 2¢, because $\frac{1}{4}$ of 8¢ = 2¢.

(*Answers of this kind always have the same name as the dividend.*)

Division being the reverse of multiplication, it will be very easy for you if you use your knowledge of multiplication in this way: Find the number which, when multiplied by the divisor, will equal the dividend; as for example: In dividing 8 by 2 the answer is 4 because 4 is the only number which, when multiplied by 2, gives a product of 8; therefore, $8 \div 2 = 4$ because 2 four's = 8.

Lesson 28

Division Table of 2's

$2\overline{)2} = 1.$	$2\overline{)12} = 6.$
$2\overline{)4} = 2.$	$2\overline{)14} = 7.$
$2\overline{)6} = 3.$	$2\overline{)16} = 8.$
$2\overline{)8} = 4.$	$2\overline{)18} = 9.$
$2\overline{)10} = 5.$	$2\overline{)20} = 10.$

When you divide by 2, you are finding one-half ($\frac{1}{2}$) of a number, and you are also finding how many 2's there are in a number.

Exercise 49—Oral.

1. Give the quotient of each of the following examples:

$\frac{?}{2)8}$ $\frac{?}{2)12}$ $\frac{?}{2)18}$ $\frac{?}{2)6}$ $\frac{?}{2)14}$

$\overset{?}{2)\overline{10}}$ $\overset{?}{2)\overline{4}}$ $\overset{?}{2)\overline{20}}$ $\overset{?}{2)\overline{2}}$ $\overset{?}{2)\overline{16}}$

2. Give the quotient of each of the following examples:

> Notice that in this form of division, the divisor is written before the dividend:
>
> $$\begin{array}{l} \quad 4 \text{ (Quotient)} \\ \text{(Divisor) } 2)\overline{8} \text{ (Dividend)} \end{array}$$

$\overset{?}{2)\overline{6}}$ $\overset{?}{2)\overline{10}}$ $\overset{?}{2)\overline{4}}$ $\overset{?}{2)\overline{16}}$ $\overset{?}{2)\overline{20}}$

$\overset{?}{2)\overline{14}}$ $\overset{?}{2)\overline{8}}$ $\overset{?}{2)\overline{18}}$ $\overset{?}{2)\overline{12}}$ $\overset{?}{2)\overline{2}}$

3. Find one-half of 6; 16; 12; 8; 10.

4. Find $\frac{1}{2}$ of 20; 4; 14; 2; 18.

Exercise 50—Oral.

First say which kind of a division example each is, then give the answer:

1. What is the cost of 1 of each of these articles if:
(These answers are found by division because the cost of 2 articles ÷ 2 = the cost of 1 article.)

2 pencils cost 8¢? 2 newspapers cost 4¢?
2 slates cost 18¢? 2 pens cost 2¢?
2 rulers cost 14¢? 2 postage stamps cost 10¢?

2. If 8 apples are divided equally between several boys, and each boy receives 4 apples, how many boys are there?

3. Since there are 14 days in 2 weeks, how many days are there in 1 week? How many days in 3 weeks? How many days in 4 weeks?
4. If John has 20 marbles and Fred has one-half as many, how many marbles has Fred? How many have they together?
5. If 2 persons can sit in a row-boat, how many row-boats will be needed to carry 16 persons?
6. If a piece of chalk lasts 2 days, how many pieces will be used in 2 school weeks of 5 days each?
7. Arthur has 4 cents and Jack has 8 cents. If they put their money together and then divide it equally between them, how much would each receive?
8. If there are 18 children at a party and $\frac{1}{2}$ of them go home, how many children remain?
9. There are 2 shoe-laces to the pair; how many pairs are there in 12 laces?
10. Harry had 16 pencils; $\frac{1}{2}$ of them were blue; how many blue pencils had he?

Lesson 29

Division Table of 3's

$3\overline{)3} = 1.$	$3\overline{)18} = 6.$
$3\overline{)6} = 2.$	$3\overline{)21} = 7.$
$3\overline{)9} = 3.$	$3\overline{)24} = 8.$
$3\overline{)12} = 4.$	$3\overline{)27} = 9.$
$3\overline{)15} = 5.$	$3\overline{)30} = 10.$

When you divide by 3, you are finding one-third ($\frac{1}{3}$) of a number, and you are also finding how many 3's there are in a number.

Exercise 51—Oral.

1. Give the quotient of each of the following examples:

$$\begin{array}{lllll} \overset{?}{3\overline{)21}} & \overset{?}{3\overline{)12}} & \overset{?}{3\overline{)18}} & \overset{?}{3\overline{)9}} & \overset{?}{3\overline{)15}} \\ \overset{?}{3\overline{)6}} & \overset{?}{3\overline{)30}} & \overset{?}{3\overline{)24}} & \overset{?}{3\overline{)27}} & \overset{?}{3\overline{)3}} \end{array}$$

2. Give the quotient of each of the following examples:

$$\begin{array}{lllll} \overset{?}{3\overline{)18}} & \overset{?}{3\overline{)24}} & \overset{?}{3\overline{)9}} & \overset{?}{3\overline{)15}} & \overset{?}{3\overline{)27}} \\ \overset{?}{3\overline{)6}} & \overset{?}{3\overline{)30}} & \overset{?}{3\overline{)12}} & \overset{?}{3\overline{)21}} & \overset{?}{3\overline{)3}} \end{array}$$

3. Find one-third of 3; 18; 15; 6; 21.
4. Find $\frac{1}{3}$ of 27; 9; 24; 30; 12.

Exercise 52—Oral.

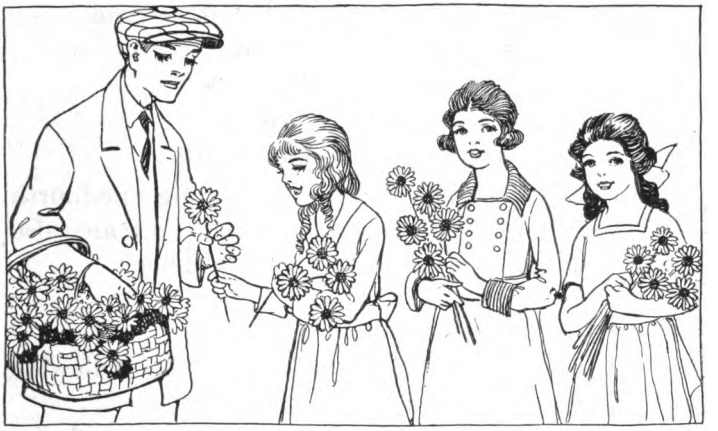
First say which kind of a division example each is, then give the answer:

1. What is the cost of 1 pound of each of these articles if:

   3 pounds of flour cost 21¢?
   3 pounds of sugar cost 27¢?
   3 pounds of rice cost 30¢?
   3 pounds of starch cost 15¢?
   3 pounds of rolled oats cost 18¢?
   3 pounds of grapes cost 24¢?

2. If a man earns $12.00 in 3 days, how much does he earn in 1 day? How much in 6 days?

3. If a boy walks 9 miles in 3 hours, how far does he walk in one-third the time?
4. If a man divided 30¢ equally between his 3 children, how much would each child receive? If two of them put their shares together, how much would that be?
5. If you have to use 3 eggs to make 1 cake, how many cakes can be made from 27 eggs?



6. If 15 flowers are divided equally between 3 girls, how many flowers would each girl receive?
7. If 21 birds are divided equally between 3 cages, how many birds will be put in each cage?
8. If Mary knits 3 rows on a sweater in 1 hour, how many hours will it take her to knit 18 rows?
9. If John chops 3 logs in 1 hour, how long will it take him to chop 24 logs?
10. If William walks 3 miles in 1 hour, how long will it take him to walk 6 miles?

11. If a cage containing 12 birds was left open through carelessness and $\frac{1}{3}$ of the birds flew away, how many birds were left in the cage?
12. What is the difference between the cost of a 15¢ slate and one which costs $\frac{1}{3}$ less?

Lesson 30

Division Table of 4's

$4\overline{)4} = 1.$	$4\overline{)24} = 6.$
$4\overline{)8} = 2.$	$4\overline{)28} = 7.$
$4\overline{)12} = 3.$	$4\overline{)32} = 8.$
$4\overline{)16} = 4.$	$4\overline{)36} = 9.$
$4\overline{)20} = 5.$	$4\overline{)40} = 10.$

When you divide by 4, you are finding one-fourth or one-quarter ($\frac{1}{4}$) of a number, and you are also finding how many 4's there are in a number.

Exercise 53—Oral.

1. Give the quotient of each of the following examples:

$4\overline{)\overset{?}{36}}$	$4\overline{)\overset{?}{24}}$	$4\overline{)\overset{?}{28}}$	$4\overline{)\overset{?}{20}}$	$4\overline{)\overset{?}{12}}$
$4\overline{)\overset{?}{16}}$	$4\overline{)\overset{?}{8}}$	$4\overline{)\overset{?}{4}}$	$4\overline{)\overset{?}{40}}$	$4\overline{)\overset{?}{32}}$

2. Give the quotient of each of the following examples:

$4\overline{)\overset{?}{40}}$	$4\overline{)\overset{?}{12}}$	$4\overline{)\overset{?}{36}}$	$4\overline{)\overset{?}{8}}$	$4\overline{)\overset{?}{20}}$
$4\overline{)\overset{?}{16}}$	$4\overline{)\overset{?}{24}}$	$4\overline{)\overset{?}{4}}$	$4\overline{)\overset{?}{28}}$	$4\overline{)\overset{?}{32}}$

3. Find one-fourth of 20; 8; 36; 12.
4. Find one-quarter of 40; 32; 28.
5. Find $\frac{1}{4}$ of 24; 16; 4.

Exercise 54—Oral.

First say which kind of a division example each is, then give the answer:

1. What is the cost of 1 yard of each of the following articles if:

   4 yards of tape cost 16¢?
   4 yards of calico cost 40¢?
   4 yards of gingham cost 36¢?
   4 yards of braid cost 20¢?
   4 yards of ribbon cost 32¢?
   4 yards of elastic cord cost 28¢?
   4 yards of cheese-cloth cost 24¢?
   4 yards of rope cost 8¢?
   4 yards of bunting cost 12¢?

2. If 4 boys have 16¢ in all, and each has the same amount, how much has each boy?
3. If 4 trains pass a given point every day of 24 hours, and the time between the trains is equal, how many hours are the trains apart?
4. There are 32 wires on a telegraph pole, and each arm on the pole carries 4 wires; how many arms are there on the pole? How many more arms would be needed to carry 8 more wires?
5. Mrs. Smith is 40 years old and her daughter Ann is one-fourth as old; how old is Ann?
6. If you had 16 marbles and lost $\frac{1}{4}$ of them, how many would you have left?

7. If 4 persons can sit in a buggy, how many buggies will be needed to carry 36 persons?

8. 12 inches = 1 foot. If a foot of ribbon is cut into 4 equal pieces, how many inches long is each piece? What part of a foot is that?

LESSON 31

Division Table of 5's

$5\overline{)5} = 1.$	$5\overline{)30} = 6.$
$5\overline{)10} = 2.$	$5\overline{)35} = 7.$
$5\overline{)15} = 3.$	$5\overline{)40} = 8.$
$5\overline{)20} = 4.$	$5\overline{)45} = 9.$
$5\overline{)25} = 5.$	$5\overline{)50} = 10.$

When you divide by 5, you are finding one-fifth ($\frac{1}{5}$) of a number, and you are also finding how many 5's there are in a number.

Exercise 55—Oral.

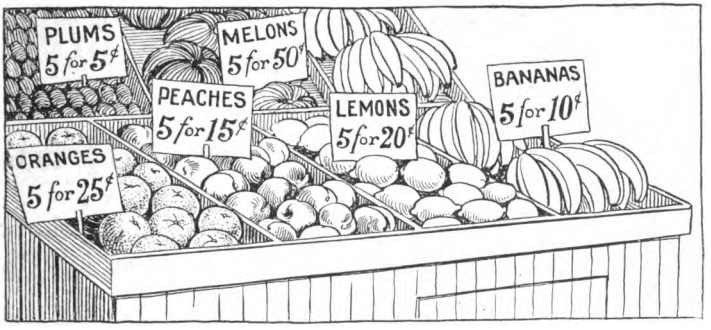
1. Give the quotient of each of the following:

$5\overline{)40}$	$5\overline{)25}$	$5\overline{)15}$	$5\overline{)30}$	$5\overline{)35}$
$5\overline{)20}$	$5\overline{)45}$	$5\overline{)50}$	$5\overline{)5}$	$5\overline{)10}$
$5\overline{)25}$	$5\overline{)10}$	$5\overline{)40}$	$5\overline{)15}$	$5\overline{)35}$
$5\overline{)20}$	$5\overline{)5}$	$5\overline{)30}$	$5\overline{)50}$	$5\overline{)45}$

2. Find one-fifth of 30; 40; 10; 5; 25.
3. Find $\frac{1}{5}$ of 20; 45; 35; 15; 50.

Exercise 56—Oral.

First say which kind of a division example each is, then give the answer:



1. What is the cost of 1 of each of the following if:
   5 oranges cost 25¢? 5 bananas cost 10¢?
   5 lemons cost 20¢? 5 melons cost 50¢?
   5 peaches cost 15¢? 5 plums cost 5¢?

2. How many men will earn $20. in one day if each man earns $5.?
3. What is one-fifth of 40?
4. How many children from a class of 35 were promoted to fourth grade if $\frac{1}{5}$ of the children were promoted?
5. How old will you be when 5 times your age is 50 years?
6. How many school weeks of 5 days each are there in 30 school days?
7. If $\frac{1}{5}$ of all your money is 1¢, how much money have you?
8. If you have 25¢ and spend $\frac{1}{5}$ of it, how much money will you have left?

Exercise 57—Oral.

1. Say in your own words what division means.
2. Say in your own words what the dividend is.
3. Say in your own words what the divisor is.
4. In division, what is the answer called?
5. What is the sign of division?
6. Division is the reverse of what?
7. What is the name of the number which is to be divided?
8. What is the name of the number which shows into how many parts the other number is to be divided?
9. Is the divisor written before or after the sign of division in this form: $3 \div 3 = 1$.
10. Is the divisor written before or after the sign of division in this form: $3\overline{)3}$

11. Is the divisor written above or below the line in this form: $\frac{1}{3}$.

LESSON 32

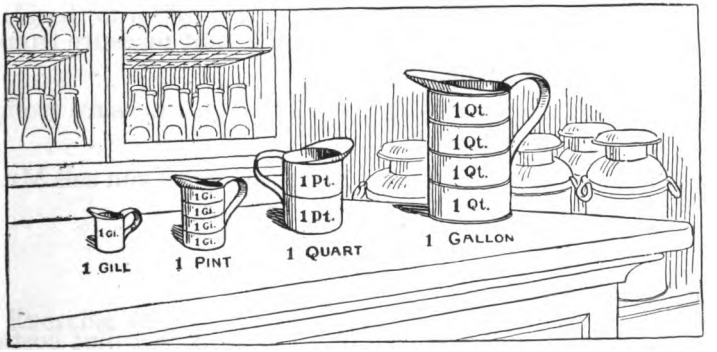
Liquid Measure

(Used for measuring water, milk, and other common liquids)

4 gills = 1 pint
2 pints = 1 quart
4 quarts = 1 gallon

4 gi. = 1 pt.
2 pt. = 1 qt.
4 qt. = 1 gal.

(Note:—The gill is seldom used.)



Exercise 58—Oral.

(If possible, use each measure once or twice so you will know each at once.)

1. How many gills are there in 1 pint?
2. How many pints are there in 1 quart?

3. How many quarts are there in 1 gallon?
4. Make a table of Liquid Measure.
5. Of these measures, which one is the smallest? Which one is the largest?
6. Since there are 4 gills in 1 pint and 2 pints in 1 quart, how many gills are there in 1 quart? 4 gi. $\times$ 2 = ? gills.
7. Since there are 2 pints in 1 quart and 4 quarts in 1 gallon, how many pints are there in 1 gallon? 2 pt. $\times$ 4 = ? pints.
8. What does gi. stand for? What does pt. stand for? What does qt. stand for? What does gal. stand for?
9. What table of measure is used in buying milk?
10. How many times can you fill a quart measure from a gallon measure?
11. How many times can you fill a pint measure from a quart measure?
12. How many times can you fill a gill measure from a pint measure?
13. If you had only a pint measure, could you sell Mr. Brown a gallon of milk? How?

Exercise 59—Oral.

1. What is the cost of a quart of milk if a pint costs 5¢?
2. What is the cost of a quart of gasoline if a gallon costs 20¢? What part of 20¢ is that?
3. If a quart of oil costs 4¢, what is the cost of a gallon? What is the cost of a pint?
4. How many pints are there in a gallon?

5. What is the cost of a quart of kerosene @ 16¢ a gallon? What part of a gallon is a quart?
6. How many quarts are there in 10 gallons?
7. How many pints will remain in a gallon measure after you draw off 1 quart?
8. How many pints will remain in a gallon measure after you draw off 1 pint?
9. If you know the cost of a pint of anything, how do you find the cost of a quart?
10. If you know the cost of a quart of anything, how do you find the cost of a gallon?

LESSON 33

Dry Measure

(Used for measuring grains, fruit, vegetables, and so on)

2 pints = 1 quart
8 quarts = 1 peck
4 pecks = 1 bushel

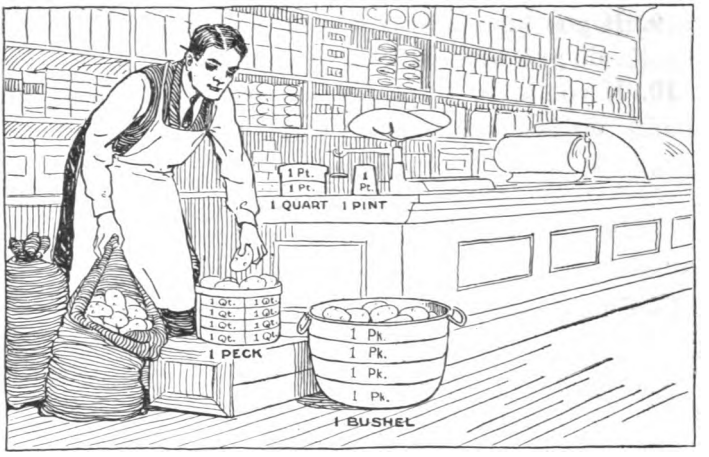
2 pt. = 1 qt.
8 qt. = 1 pk.
4 pk. = 1 bu.

Exercise 60—Oral.

Take the measures to find the following:

1. How many pints are there in 1 quart?
2. How many quarts are there in 1 peck?
3. How many pecks are there in 1 bushel?
4. Say the table of Dry Measure. Write it for yourself.

5. How many liquid pints are there in 1 quart? How many dry pints are there in 1 quart? Is there any difference between the two?
6. Since there are 2 pints in 1 quart and 8 quarts in 1 peck, how many pints are there in 1 peck? 2 pt. $\times$ 8 = ? pints.



7. Since there are 8 quarts in 1 peck and 4 pecks in 1 bushel, how many quarts are there in 1 bushel? 8 qt. $\times$ 4 = ? quarts.
8. What does pt. stand for? What does qt. stand for? What does pk. stand for? What does bu. stand for?
9. Which measures can be used in buying cider or other liquids? Which ones in buying oats? Which ones in buying grain or fruit?
10. How many times can you fill a peck measure from a bushel basket? What part of 1 bushel is 1 peck?

11. How many times can you fill a quart measure from a peck measure?
12. How many times can you fill a pint measure from a quart measure? What part of a quart is each pint?
13. Put your hand on each small measure and tell how many of them are found in each of the larger measures.

Exercise 61—Oral.

1. What is the cost of a quart of string beans if a pint costs 5¢?
2. What is the cost of a peck of potatoes if a quart costs 5¢?
3. How long will a bushel of potatoes last a family, if the family uses a peck every 5 days?
4. How many pecks are there in 5 bushels?
5. How many pecks will remain in a bushel basket if you remove 1 peck? If you remove 2 pecks? If you remove 3 pecks?
6. How many quarts will remain in a peck measure if you remove 3 quarts? If you remove 4 quarts?
7. If you know the price of a pint of anything, how do you find the price of a quart? Play you are the milkman—make a problem for this.
8. If you know the price of a quart of anything, how do you find the price of a peck? Play you are the grocer—make a problem for this.
9. If you know the price of a peck of anything, how do you find the price of a bushel? Play you are selling apples—make a problem for this.

LESSON 34

Multiplication Table of 6's

Give the sum of each column:

1 six	2 six's	3 six's	4 six's	5 six's
6	6	6	6	6
	6	6	6	6
		6	6	6
			6	6
				6

6 six's	7 six's	8 six's	9 six's	10 six's
6	6	6	6	6
6	6	6	6	6
6	6	6	6	6
6	6	6	6	6
6	6	6	6	6
6	6	6	6	6
	6	6	6	6
		6	6	6
			6	6
				6

2 six's = 12. 6 six's = 36.
3 six's = 18. 7 six's = 42.
4 six's = 24. 8 six's = 48.
5 six's = 30. 9 six's = 54.
10 six's = 60.

Exercise 62—Oral.

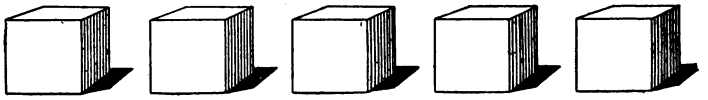
1. Give the product of each of the following examples:

4 six's = ? 8 six's = ? 10 six's = ? 9 six's = ?
3 six's = ? 2 six's = ? 5 six's = ? 7 six's = ?
6 six's = ? 1 six = ?

2. Give the product of each of the following examples:

6	9	8	6	6	10	7	6	6	6
3	6	6	4	2	6	6	5	1	6

3. How many quarts are two times 6 quarts?
4. How many gallons are four times 6 gallons?
5. How many pecks are eight times 6 pecks?
6. How many bushels are four times 6 bushels?
7. If a man works 6 days a week @ $6.00 a day, what does he receive for the week's work?
8. There are 6 working days in a week; how many working days are there in 8 weeks? How many in 9 weeks? How many in 10 weeks?
9. A box has 4 sides, 1 top and 1 bottom; a box, therefore, has 6 faces; how many faces do 7 boxes have?



10. A cube, like a box, also has 6 faces; how many faces do 5 cubes have?
11. What is the cost of 9 tables @ $6.00 each?
12. The depth of any large body of water is measured by fathoms, and a fathom is equal to 6 feet; how deep is a lake if it is 7 fathoms deep?

Exercise 63—Oral.

1. How many pints are there in 6 quarts?
2. How many quarts are there in 6 gallons?
3. How many pecks are there in 5 bushels?

4. There are 3 feet in a yard; how many feet are there in 9 yards?
5. How many cents are there in 4 nickels?
6. If there are 2 lights in each room, how many lights are there in 8 rooms?
7. If there are 4 trees in each field, how many trees are there in 7 fields?
8. At 6 cents each, what is the cost of 9 writing pads?
9. If Florence came to school on time every school-day for 10 weeks, how many days did she come on time?
10. If Fred came to school late 2 days every week for 9 weeks, how many days was he late? (Fred was not promoted.)

Lesson 35

Division Table of 6's

$6\overline{)6} = 1.$	$6\overline{)36} = 6.$
$6\overline{)12} = 2.$	$6\overline{)42} = 7.$
$6\overline{)18} = 3.$	$6\overline{)48} = 8.$
$6\overline{)24} = 4.$	$6\overline{)54} = 9.$
$6\overline{)30} = 5.$	$6\overline{)60} = 10.$

When you divide by 6, you are finding one-sixth ($\frac{1}{6}$) of a number, and you are also finding how many 6's there are in a number.

Exercise 64—Oral.

1. Give the quotient of each of the following examples:

$\overset{?}{6\overline{)12}}$ $\overset{?}{6\overline{)60}}$ $\overset{?}{6\overline{)42}}$ $\overset{?}{6\overline{)48}}$ $\overset{?}{6\overline{)6}}$

$6\overline{)30}^{?}$ $6\overline{)18}^{?}$ $6\overline{)54}^{?}$ $6\overline{)24}^{?}$ $6\overline{)36}^{?}$

2. Give the quotient of each of the following examples:

$6\overline{)24}^{?}$ $6\overline{)48}^{?}$ $6\overline{)12}^{?}$ $6\overline{)54}^{?}$ $6\overline{)36}^{?}$

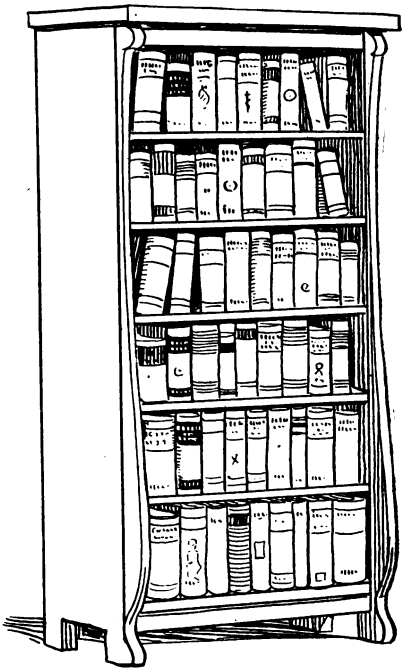
$6\overline{)42}^{?}$ $6\overline{)6}^{?}$ $6\overline{)30}^{?}$ $6\overline{)60}^{?}$ $6\overline{)18}^{?}$

3. Find one-sixth of 24; 6; 12; 60; 36.
4. Find $\frac{1}{6}$ of 42; 48; 30; 54; 18.

Exercise 65—Oral.

First say which kind of a division example each is, then give the answer:

1. If $24.00 is paid for six days' work, how much is that for 1 day? How much for 5 days?
2. If a book-case is made to hold 54 books of a certain size and it has 6 shelves, how many books can be put on each shelf? What part of 54 is that?



3. If a hotel has 48 guests and only 6 guests can sit at one table in the dining room, how many tables must there be so that all the guests can eat at one time?
4. What is one-sixth of 24 hours? Of 36 hours? Of 48 hours?
5. If 6 persons can ride in each automobile, how many automobiles will be needed for a party of 60 persons? How many for a party of 30 persons?
6. If a board 12 feet long is cut into 6 equal parts, how long will each part be? What will be the length of 4 of these parts?
7. What is $\frac{1}{6}$ of the distance between two posts which are 42 feet apart?
8. What is the difference between the cost of two suits of clothes, if one costs $12.00 and the other $\frac{1}{6}$ less?

Lesson 36

Table Used in Counting Merchandise

(Used for counting merchandise of all kinds)

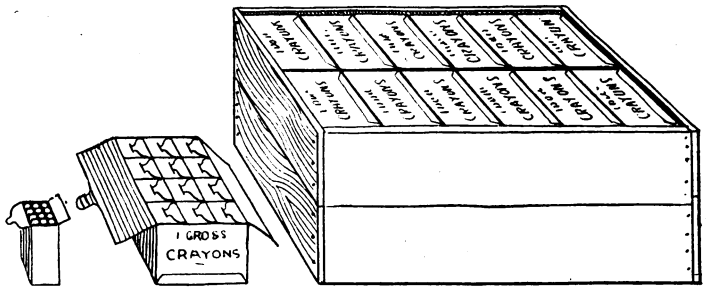
12 things = 1 dozen
12 dozen = 1 gross
12 gross = 1 great gross

12 things = 1 doz.
12 doz. = 1 gr.
12 gr. = 1 gt. gr.

(Note:—20 things are sometimes called 1 score.)

Exercise 66—Oral.

1. How many things are there in 1 dozen? In $\frac{1}{2}$ dozen? In $\frac{1}{3}$ dozen? In $\frac{1}{4}$ dozen? In $\frac{1}{6}$ dozen? (Examine a full box of crayon and a full box of pens.)



1 DOZEN 1 GROSS 1 GREAT GROSS

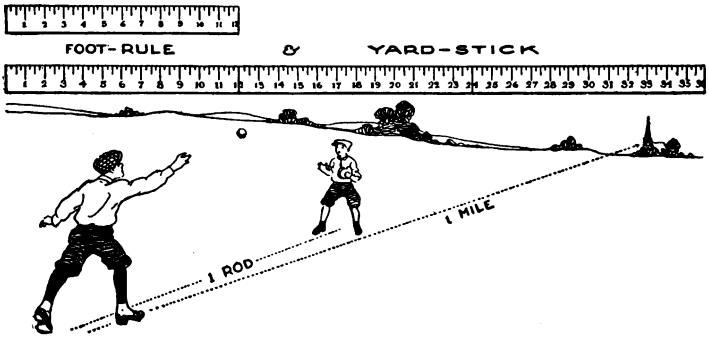
2. How many dozen are there in 1 gross? In $\frac{1}{6}$ gross? In $\frac{1}{4}$ gross? In $\frac{1}{3}$ gross? In $\frac{1}{2}$ gross?
3. How many gross are there in 1 great gross? In $\frac{1}{4}$ great gross? In $\frac{1}{6}$ great gross? In $\frac{1}{3}$ great gross? In $\frac{1}{2}$ great gross?
4. How many things are there in a score?
5. A life-time is often spoken of as "Three score and ten years"; can you find out how many years that is?
6. If a dozen oranges cost 30¢, what is the cost of 4 oranges? What is the cost of 2 oranges?
7. What does doz. stand for? What does gr. stand for? What does gt. gr. stand for?
8. If bananas cost 20¢ a dozen, how much will you have to pay for 6 bananas? How much for 3 bananas? How much for 9 bananas?

9. How many things are there in $\frac{1}{2}$ dozen? How many things are there in one and one-half dozen?
10. How many things are there in $\frac{1}{6}$ dozen? How many 2's are there in 12? If 2 apples cost 5¢, how much will 12 apples cost?
11. If $\frac{1}{6}$ dozen peaches cost 5¢, how much will 1 dozen peaches cost?
12. Say the table which is used in counting merchandise.

Lesson 37

Linear Measure

(Used for measuring lines and distances)



12 inches = 1 foot
3 feet = 1 yard
$5\frac{1}{2}$ yards = 1 rod
320 rods = 1 mile

12 in. = 1 ft.
3 ft. = 1 yd.
$5\frac{1}{2}$ yd. = 1 rd.
320 rd. = 1 mi.

Note:—The sign (″) is sometimes used for inches.
The sign (′) is sometimes used for feet.

Exercise 67—Oral.

1. How many inches are there in 1 foot? In $\frac{1}{2}$ foot? In $\frac{1}{3}$ foot? In $\frac{1}{4}$ foot? In $\frac{1}{6}$ foot? What part of a foot are 6 inches?
2. (Use a yard-stick or tape-measure—study it.) How many feet are there in 1 yard? In $\frac{1}{3}$ yard? In $\frac{2}{3}$ yards? In 9 yards? In 7 yards? What part of a yard is a foot?
3. (Find something in your schoolroom that is 1 rod or $16\frac{1}{2}$ feet long.) How many yards are there in 1 rod?
4. (Locate something in your neighborhood that is about 1 mile distant.) How many rods are there in 1 mile?
5. Say the table of Linear Measure.
6. A straight line is the shortest distance between two points; how long do you think each of these straight lines is:
   1. _____
   2. _____
   3. _____
7. If two posts are 24 feet apart, how many yards is that? How many yards are there in $\frac{1}{2}$ the distance? How many yards are there in $\frac{1}{4}$ the distance? How many feet are there in $\frac{1}{4}$ the distance?
8. If a piece of cloth 6 yards long is cut into 3 equal pieces, how many feet will there be in each piece? (Find your answer in two ways.)

9. If a piece of rope 2 yards long is cut into 6 equal pieces, how many feet will there be in each piece? How many inches will there be in each piece?
10. What is the meaning of in.? Of ft.? Of yd.? Of rd.? Of mi.? What does (″) stand for? What does (′) stand for?
11. Without using your ruler, make two dots 6 inches apart and connect them by a straight line 6 inches long; write your name on the paper and pass it to the teacher.

Lesson 38

Multiplication Table of 7's

Give the sum of each column:

1 seven	2 seven's	3 seven's	4 seven's	5 seven's
7	7	7	7	7
	7	7	7	7
		7	7	7
			7	7
				7

6 seven's	7 seven's	8 seven's	9 seven's	10 seven's
7	7	7	7	7
7	7	7	7	7
7	7	7	7	7
7	7	7	7	7
7	7	7	7	7
7	7	7	7	7
	7	7	7	7
		7	7	7
			7	7
				7

2 seven's = 14. 6 seven's = 42.
3 seven's = 21. 7 seven's = 49.
4 seven's = 28. 8 seven's = 56.
5 seven's = 35. 9 seven's = 63.
10 seven's = 70.

Exercise 68—Oral.

1. Give the product of each of the following examples:

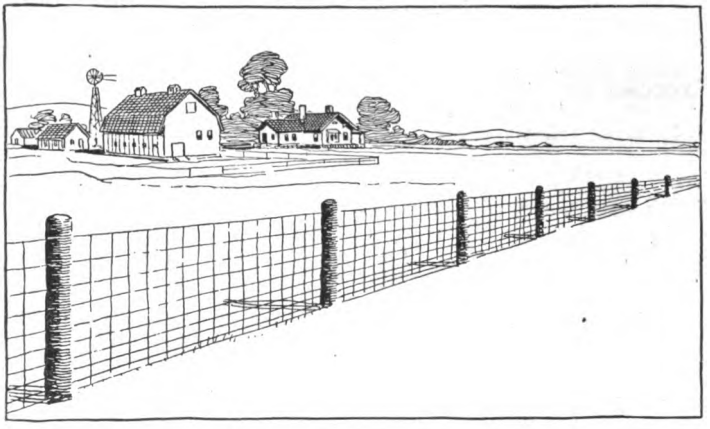
4 seven's = ? 3 seven's = ? 6 seven's = ?
7 seven's = ? 9 seven's = ? 5 seven's = ?
8 seven's = ? 1 seven = ? 2 seven's = ?
10 seven's = ?

2. Give the product of each of the following examples:

7	7	7	7	7	7	7	10	8	9
5	1	3	6	2	7	4	7	7	7

3. How many yards are three times 7 yards?
4. There are 7 days in a week; how many days are there in 4 weeks? How many in 8 weeks? How many in 3 weeks? How many in 6 weeks?
5. If you earned a cent every day in the week for 5 weeks, how many cents would you have? If you changed all of these cents into nickels, how many nickels would there be?
6. If it takes you 7 minutes to walk to school, how many minutes do you spend going to and from school in 2 days?
7. If, in your house, there are 7 steps in each flight of stairs, how many steps are there in 6 flights? If there are two flights between each two floors, how many floors has the house?

8. If 7 posts are placed so that there are 5 yards between each two posts, how far is it from the first to the seventh post? How far is it from the first to the fourth post?



9. If 9 boys went fishing and each boy caught 7 fish, how many fish did they catch in all?

Exercise 69—Oral.

1. You may now make two good problem stories for each example in the second set of Exercise 68.

LESSON 39

Division Table of 7's

$7\overline{)7} = 1.$	$7\overline{)42} = 6.$
$7\overline{)14} = 2.$	$7\overline{)49} = 7.$
$7\overline{)21} = 3.$	$7\overline{)56} = 8.$
$7\overline{)28} = 4.$	$7\overline{)63} = 9.$
$7\overline{)35} = 5.$	$7\overline{)70} = 10.$

When you divide by 7, you are finding one-seventh ($\frac{1}{7}$) of a number, and you are also finding how many 7's there are in a number.

Exercise 70—Oral.

1. Give the quotient of each of the following examples:

$7\overline{)49}$ $7\overline{)35}$ $7\overline{)56}$ $7\overline{)28}$ $7\overline{)42}$

$7\overline{)63}$ $7\overline{)14}$ $7\overline{)70}$ $7\overline{)7}$ $7\overline{)21}$

2. Give the quotient of each of the following examples:

$7\overline{)49}$ $7\overline{)7}$ $7\overline{)28}$ $7\overline{)56}$ $7\overline{)35}$

$7\overline{)14}$ $7\overline{)42}$ $7\overline{)63}$ $7\overline{)21}$ $7\overline{)70}$

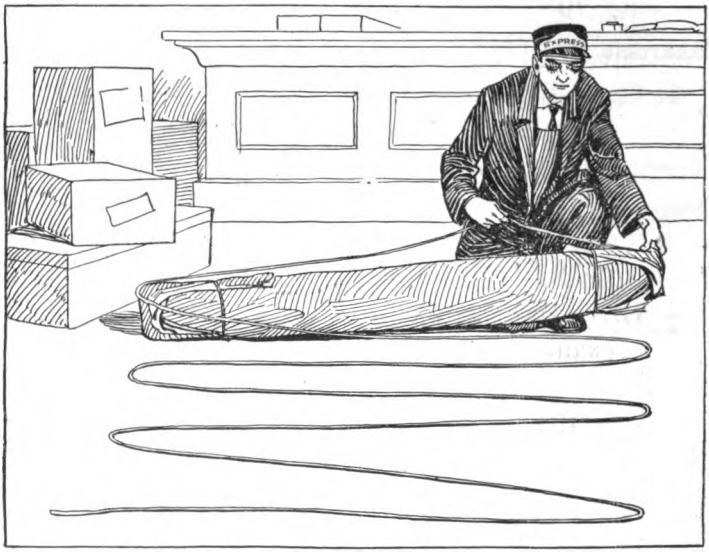
3. Find one-seventh of 63; 28; 14; 56; 42.
4. Find $\frac{1}{7}$ of 35; 21; 49; 7; 70.

Exercise 71—Oral.

First say which kind of a division example each is, then give the answer:

1. How many weeks are there in 35 days? In 49 days? In 42 days?
2. How many feet are there in one-seventh of 49 yards? How many pints are there in $\frac{1}{7}$ of 35 quarts? How many quarts are there in $\frac{1}{7}$ of 42 pecks?

3. If 7 pails of water will fill a 21-gallon tank, how many gallons does the pail hold? How many quarts does the pail hold?



4. If a piece of rope 42 feet long is 7 times as long as the bundle it is going to be used on, how many feet long is the bundle? How many yards long is the bundle?
5. If one-seventh of the bananas on a bunch of 70 bananas are spoiled, how many good bananas are there on the bunch?
6. If Charles has 28¢ and William has $\frac{1}{7}$ more, how many cents has William?
7. If Frank has 35¢ and gives $\frac{1}{7}$ to Tom, how many cents will Tom have? How many cents will Frank have left?

8. Grandpa is three score and ten years old; how many times 7 years is that?
9. If several 9-foot boards placed end to end are 63 feet long, how many boards are there? How long is each board measured in yards?
10. If 7 times the width of a board is 42″, what is the width of the board? What part of a foot is that?

Exercise 72—Oral.

Read:

1. 10 qt.; 4 pt.; 8 gi.; 19 gal.
2. 6 qt.; 10 bu.; 8 pk.; 3 pt.
3. 6 doz.; 14 gr.; 3 gt. gr.
4. 9 in.; 4 ft.; 9 yd.; 80 rd.; 40 mi.
5. 16″; 14′; 16′3″; 24′9″; 37′4″.

Lesson 40

Avoirdupois Weight

(Used for weighing all common things, such as sugar, meat, soap, hay, etc.)

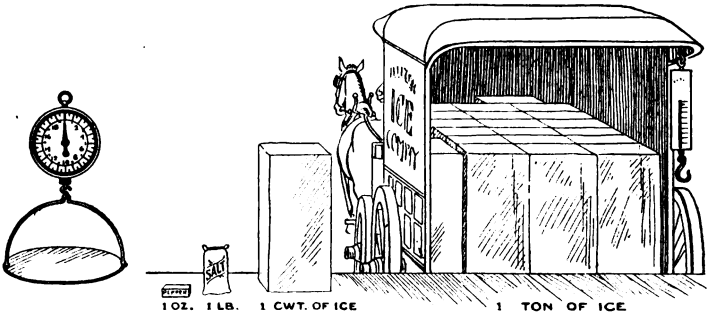
16 ounces = 1 pound
100 pounds = 1 hundredweight
20 hundredweight = 1 ton

16 oz. = 1 lb.
100 lb. = 1 cwt.
20 cwt. = 1 T.

(Note:—The sign (#) written after a number, is often used by business houses instead of the word pound.)

Exercise 73—Oral. (Use a pair of scales if possible.)

1. How many ounces are there in 1 pound? How many in $\frac{1}{2}$ pound? How many in $\frac{1}{4}$ pound? How many in $1\frac{1}{4}$ pounds?



2. How many pounds are there in 1 hundredweight? How many in 2 hundredweight?
3. How many hundredweight are there in 1 ton? How many in $\frac{1}{2}$ ton? How many in $\frac{1}{4}$ ton? How many in $\frac{1}{5}$ ton?
4. Say the table of Avoirdupois Weight.
5. If a pound of coffee costs 40¢, how much will 4 ounces cost? How much will 8 ounces cost?
6. What does oz. stand for? lb.? cwt.? T.? #?
7. Read: 21 lb.; 14 oz.; 10 cwt.; 9 T.; 28#; 14 lb. 4 oz.
8. If a ton of coal costs $7.00, how much will 8 tons cost?
9. How many 4 oz. weights are equal to a 1 lb. weight?
10. If a pound of sugar costs 7¢, how much will 9 lb. cost?

Exercise 74—Oral Review.

1. Say the multiplication table of 3's.
2. Say the division table of 4's.
3. Say the multiplication table of 5's.
4. Say the division table of 6's.
5. Say the multiplication table of 7's.
6. What is $\frac{1}{3}$ of 27? $\frac{1}{4}$ of 24? $\frac{1}{6}$ of 18? $\frac{1}{5}$ of 15? $\frac{1}{6}$ of 24?
7. Say the table of Liquid Measure.
8. Say the table of Dry Measure.
9. Say the table used in counting merchandise.
10. Say the table of Linear Measure.
11. Say the table of Avoirdupois Weight.
12. Is the product of 5×6 the same as the product of 6×5?

Exercise 75—Written Review.

1. A railroad train had 48 passengers in the first coach, 54 in the second coach, 57 in the third coach, 60 in the fourth coach, and 64 in the fifth coach; how many passengers were there in all?
2. $147 + 386 + 47 + 9 + 318 = ?$
3. A man paid \$68.00 for a horse and \$55.00 for a buggy; how much more did the horse cost than the buggy? How much did they cost together?
4. $874 - 399 = ?$
5. What is the difference between 619 and 345?
6. Frank, who was saving to buy a \$25.00 bicycle, had saved \$19.72; how much more had he to save?

7. A train on the way from New York to Chicago, which is a distance of 912 miles, had already traveled 467 miles; how many miles farther had it to go?
8. A bell is fastened 48 feet from the top of a church steeple; if the steeple is 216 feet high, how far from the ground is the bell fastened?
9. A certain field is 468 yards long; 239 yards from one end of the field is a path; how far is this path from the other end of the field?
10. A certain bin contained 430 pounds of flour; how many pounds remained after removing 276 pounds?
11. John has a kite-string which is 100 yd. long; 41 yd. from one end of the string there is a knot; how far is this knot from the other end of the string?
12. Tom's kite-string has a knot 34 yd. from one end of the string and 53 yd. from the other end; how long is this string?

Lesson 41

Multiplication Table of 8's

Give the sum of each column:

1 eight	2 eight's	3 eight's	4 eight's	5 eight's
8	8	8	8	8
	8	8	8	8
		8	8	8
			8	8
				8

6 eight's	7 eight's	8 eight's	9 eight's	10 eight's
8	8	8	8	8
8	8	8	8	8
8	8	8	8	8
8	8	8	8	8
8	8	8	8	8
8	8	8	8	8
	8	8	8	8
		8	8	8
			8	8
				8

2 eight's = 16. 6 eight's = 48.
3 eight's = 24. 7 eight's = 56.
4 eight's = 32. 8 eight's = 64.
5 eight's = 40. 9 eight's = 72.
10 eight's = 80.

Exercise 76—Oral.

1. Give the product of each of the following examples:

6 eight's = ? 4 eight's = ? 9 eight's = ?
10 eight's = ? 7 eight's = ? 5 eight's = ?
3 eight's = ? 8 eight's = ? 2 eight's = ?
1 eight = ?

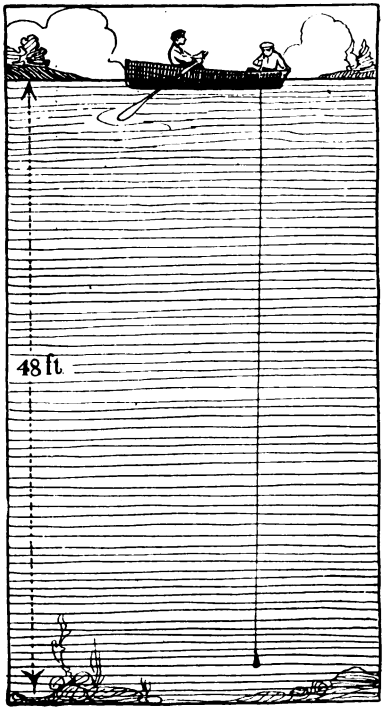
2. Give the product of each of the following examples:

8	8	8	8	8	8	8	8	9	10
4	8	1	5	3	2	7	6	8	8

Exercise 77—Oral.

1. If a yard of ribbon is worth 8¢, what are 3 yards worth?
2. How many weeks are seven times 8 weeks?

3. How many qt. are there in 8 pk.? How many qt. are there in 7 pk. and 2 qt.?



4. If a book is made up of 8-page sections and there are 10 sections in the book, how many pages has the book?
5. If a picture costs $8.00, what will be the total cost of 5 of such pictures?
6. If coal is bought at $8.00 a ton, find the cost of 9 tons.
7. If your brother earns $8.00 a week, how much will he earn in 7 weeks?
8. Do you remember how many feet there are in a fathom? How many feet are there in 8 fathoms?
9. Dora's mother was making cup-cakes in a form which held 8 cakes; if she filled the form 3 times, how many cakes were there?
10. Using 8 ft. of wire for each picture, how many feet are needed to hang 5 pictures?

LESSON 42

Division Table of 8's

$8\overline{)8} = 1.$	$8\overline{)48} = 6.$
$8\overline{)16} = 2.$	$8\overline{)56} = 7.$
$8\overline{)24} = 3.$	$8\overline{)64} = 8.$
$8\overline{)32} = 4.$	$8\overline{)72} = 9.$
$8\overline{)40} = 5.$	$8\overline{)80} = 10.$

When you divide by 8, you are finding one-eighth ($\frac{1}{8}$) of a number, and you are also finding how many 8's there are in a number.

Exercise 78—Oral.

1. Give the quotient of each of the following examples:

$8\overline{)48}^{?}$	$8\overline{)32}^{?}$	$8\overline{)80}^{?}$	$8\overline{)40}^{?}$	$8\overline{)8}^{?}$
$8\overline{)56}^{?}$	$8\overline{)24}^{?}$	$8\overline{)64}^{?}$	$8\overline{)16}^{?}$	$8\overline{)72}^{?}$

2. Give the quotient of each of the following examples:

$8\overline{)24}^{?}$	$8\overline{)64}^{?}$	$8\overline{)16}^{?}$	$8\overline{)40}^{?}$	$8\overline{)48}^{?}$
$8\overline{)56}^{?}$	$8\overline{)8}^{?}$	$8\overline{)72}^{?}$	$8\overline{)80}^{?}$	$8\overline{)32}^{?}$

3. Find one-eighth of 32; 40; 24; 64; 16.

4. Find $\frac{1}{8}$ of 56; 48; 8; 80; 72.

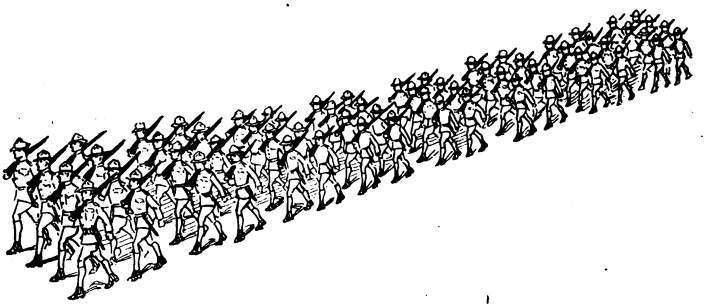
5.

$56 \div 8 = ?$	$24 \div 8 = ?$
$32 \div 8 = ?$	$64 \div 8 = ?$
$72 \div 8 = ?$	$40 \div 8 = ?$

Exercise 79—Oral.

First say which kind of a division example each is, then give the answer:

1. How many pk. are there in 72 qt.? How many in 32 qt.? How many in 48 qt.?



2. If a company of 64 soldiers is divided into squads of 8 men each, how many squads will there be? How many soldiers will there be in 5 squads? How many squads will all the boys in your room make?
3. If 8 trains pass a certain station every day of 24 hours and the time between each two trains is equal, how many hours are the trains apart?
4. There were 16 children at a party; if $\frac{1}{8}$ of the children went home early, how many went away? How many remained?
5. If 8 sticks placed end to end are 48 feet long, how many feet long is each stick? How many yards long is each stick?
6. How many oz. are there in $\frac{1}{8}$ lb.?
7. If tea costs 72¢ a lb., how much will 2 oz. cost?

8. If a truck carries 8 cases of merchandise, how many trips must the truck make to deliver 40 cases? How many trips for 56 cases? How many trips for 72 cases? How many trips for 64 cases?

LESSON 43

Arabic and Roman Numerals

The numbers which are commonly used, such as 1, 2, 3, 4, and so on, were for many years supposed to have been first used by the Arabians, and are therefore called the "Arabic Numerals."

The Romans used an entirely different method of writing numbers. They used certain capital letters which are now known as the "Roman Numerals." This method of writing numbers is used very often on watches and clocks to show the hours of the day; it is also very often used in books to show chapter numbers, and on paper money, etc.

For the present, you need learn only three of the Roman Numerals and their combinations, so that you can tell time by all watches and clocks:

I stands for 1
V stands for 5
X stands for 10

I written before V or X means subtract 1 from 5 or 10.

I written after V or X means add 1 to 5 or 10.
II written after V or X means add 2 to 5 or 10.
III written after V or X means add 3 to 5 or 10.

Using these three letters, the numbers from 1 to 12 are written in this way:

Arabic: 1. 2. 3. 4. 5. 6. 7. 8. 9. 10.
Roman: I II III IV V VI VII VIII IX X
Arabic: 11. 12.
Roman: XI XII

Exercise 80—Oral.

1. What kind of numerals are most commonly used?
2. What kind of numerals are often used on watches and clocks?
3. What number does the letter I stand for? Is this an Arabic or a Roman numeral?
4. What number does the letter V stand for? Is this an Arabic or a Roman numeral?
5. What number does the letter X stand for? Is this an Arabic or a Roman numeral?
6. What does I written before V mean?
7. What does I written after V mean? What does II written after V mean? What does III written after V mean?
8. What does I written before X mean?
9. What does I written after X mean? What does II written after X mean? What does III written after X mean?
10. What do you think XV stands for? XX? XXX?

Exercise 81—Written and Oral.

1. Read these Roman numerals:
   I; II; III; V; VI; VII; VIII; X; XI; XII; IV; IX.

2. Write in Roman numerals:
2; 1; 4; 6; 8; 10; 7; 5; 3; 9; 11; 12; 6; 4; 8; 3; 2.

LESSON 44

Measuring Time

60 seconds = 1 minute
60 minutes = 1 hour
24 hours = 1 day
7 days = 1 week

60 sec. = 1 min.
60 min. = 1 hr.
24 hr. = 1 da.
7 da. = 1 wk.

The 7 days of the week are:
Sunday
Monday
Tuesday
Wednesday
Thursday
Friday
Saturday

Exercise 82—Oral.

1. How many seconds are there in 1 minute? How many minutes are there in 1 hour? How many hours are there in 1 day? How many days are there in 1 week? How many hours are there in $\frac{1}{3}$ day? How many hours are there in $\frac{1}{4}$ day? How many hours are there in $\frac{1}{6}$ day? How many hours are there in $\frac{1}{8}$ day?

2. $5 \times 10 = 50$; $5 \times 11 = 55$; $5 \times 12 = 60$. How many times 5 minutes are there in 1 hour? What part of 1 hour is 5 minutes?
3. If it takes a horse 12 times as long to travel a certain distance as it takes a railroad train, how long will it take a horse to travel the distance that a railroad train travels in 5 minutes? 5 min. $\times$ 12 = ? min.
4. What does sec. stand for? What does min. stand for? What does hr. stand for? What does da. stand for? What does wk. stand for?
5. Say the days of the week.
6. Sunday is the first day of the week; what day is the third day? What day is the 5th day? What day is the 7th day?
7. Say the table used for measuring time.
8. How many days are there in $\frac{1}{7}$ week? How many days are there in 7 weeks?
9. What day of the week comes two days after Saturday? What day comes three days after Thursday? What day comes 7 days after Sunday?
10. What day of the week comes a week from Wednesday? What day comes 2 weeks from Friday? What day comes 4 weeks from Monday?

Lesson 45

Telling Time by the Clock

By looking at the face of a clock, or at Plate 1, you will see that by the use of Arabic or Roman numerals, the face of the clock is divided into 12 equal parts

which are numbered from 1 to 12 or from I to XII; these 12 divisions show 12 of the 24 hours that there are in every day; they are used twice in 24 hours without chance of making a mistake, as no one could look at a clock and think it was 7 o'clock in the morning when it really was 7 o'clock in the evening.

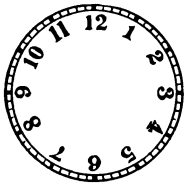


PLATE 1
FACE OF CLOCK

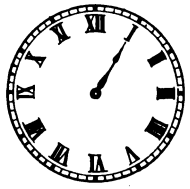


PLATE 2
HOUR HAND

PLATE 3
HOUR & MINUTE HANDS

All the hours from midnight to noon are forenoon hours, and are written with A. M. (meaning ante-meridian, or before noon) following the time, as 9 A. M., 11:30 A. M.

All the hours from noon to midnight are afternoon hours, and are written with P. M. (meaning post-meridian, or after noon) following the time, as 3 P. M., 4:30 P. M.

Now look at the two hands which are fastened in the center of the face; do you notice that one of the hands is shorter than the other? The shorter of the two hands is the hour hand, and it goes from XII to I in 1 hour, or all the way around in 12 hours, twice around in 24 hours or 1 day. Plate 2 shows how far the hour hand has gone in 1 hour from 12 to 1 o'clock.

As there are 60 minutes in 1 hour, and the face of the clock is divided into 12 parts for the hours, each of these 12 parts is divided into 5 smaller parts making

12×5 or 60 small parts in all, 1 for each minute, so that the larger of the two hands, which is the minute hand, goes all the way around in 60 minutes while the smaller hand, which is the hour hand, goes one-twelfth of the distance, as from XII to I. Plate 3 shows the hour hand at 1 o'clock and shows the minute hand after it has gone all the way around while the hour hand went from XII to I.

From this it is easily seen that the hour hand goes around once in 12 hours while the minute hand goes around once every hour, or twelve times in 12 hours, and the distance from XII to I which means 1 hour for the hour hand, means only one-twelfth of an hour or 5 minutes for the minute hand.

Exercise 83—Oral.

1. Which is the hour hand, the long or the short hand?
2. How long does it take the hour hand to go from II to III? How long from V to VIII? How long from IX to XII?
3. How long does it take the minute hand to go all the way around? How long from XII to III? How long from III to VI? How long from VI to IX? How long from IX to XII?
4. Where will the minute hand be, when the hour hand points exactly at any one of the hours? Where will the minute hand be when the hour hand points exactly between any two of the hours?
5. What time is it when both hands point exactly upward?

6. Where does each of the hands point when it is exactly 3 o'clock? Where when it is exactly 6 o'clock? Where when it is exactly 9 o'clock?
7. At what hour mark will the minute hand be, when it is 10 minutes after 2? Where at 20 minutes after 2? Where at 30 minutes after 2?
8. What does 10:30 A. M. mean? What does 11:45 A. M. mean? What does 6:15 P. M. mean? What does 8 P. M. mean? What does 10:30 P. M. mean?
9. How many minutes after 6 is it when you say "It is half past 6"? How many minutes after 6 is it when you say "It is quarter after 6"?
10. At what hour mark will the minute hand be, when it is 25 minutes to 7? Where when it is 20 minutes to 8? Where when it is 10 minutes to 9?
11. What does "quarter to 11" mean? What does "ten thirty" mean? What does "ten fifty" mean?

LESSON 46

Multiplication Table of 9's

Give the sum of each column:

1 nine	2 nine's	3 nine's	4 nine's	5 nine's
9	9	9	9	9
	9	9	9	9
		9	9	9
			9	9
				9

6 nine's	7 nine's	8 nine's	9 nine's	10 nine's
9	9	9	9	9
9	9	9	9	9
9	9	9	9	9
9	9	9	9	9
9	9	9	9	9
9	9	9	9	9
	9	9	9	9
		9	9	9
			9	9
				9

2 nine's = 18. 6 nine's = 54.
3 nine's = 27. 7 nine's = 63.
4 nine's = 36. 8 nine's = 72.
5 nine's = 45. 9 nine's = 81.
10 nine's = 90.

Exercise 84—Oral.

1. Give the product of each of the following examples:

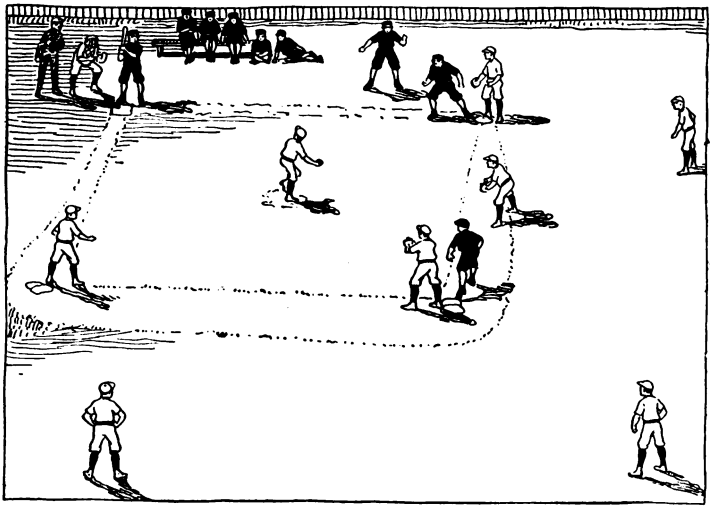
5 nine's = ?	1 nine = ?	10 nine's = ?
3 nine's = ?	7 nine's = ?	4 nine's = ?
6 nine's = ?	2 nine's = ?	9 nine's = ?
	8 nine's = ?	

2. Give the product of each of the following examples:

9	9	9	9	9	9	9	9	9	10
9	1	8	2	7	3	6	4	5	9

3. How many weeks are seven times 9 weeks?
4. If it takes a paper-hanger 9 hours to paper 1 room, how long will it take him to paper 6 rooms of the same size? How long for 7 rooms? How long for 8 rooms? How long for 9 rooms?

5. If there are 9 boys on a baseball team, how many boys are there on 2 teams?



6. If each book in a set of 3 books costs \$9.00, what is the cost of the set?
7. If John works for \$9.00 a week, how much money will he receive in 6 weeks? How much money will he receive in 10 weeks?
8. If there are 9 rooms in each house, how many rooms are there in 3 houses? How many rooms are there in 7 houses?
9. If it costs 9¢ to burn an electric light every evening for a week, how much will it cost to burn it every evening for 10 weeks? How much for 5 weeks?
10. If you sleep 9 hours every night, how many hours will you sleep in a week?

Exercise 85—Oral.

1. Make two good problem stories for each example in the second set of Exercise 84.

LESSON 47

Division Table of 9's

$9\overline{)9} = 1.$	$9\overline{)54} = 6.$
$9\overline{)18} = 2.$	$9\overline{)63} = 7.$
$9\overline{)27} = 3.$	$9\overline{)72} = 8.$
$9\overline{)36} = 4.$	$9\overline{)81} = 9.$
$9\overline{)45} = 5.$	$9\overline{)90} = 10.$

When you divide by 9, you are finding one-ninth ($\frac{1}{9}$) of a number, and you are also finding how many 9's there are in a number.

Exercise 86—Oral.

1. Give the quotient of each of the following examples:

$\overset{?}{9\overline{)54}}$ $\overset{?}{9\overline{)90}}$ $\overset{?}{9\overline{)36}}$ $\overset{?}{9\overline{)45}}$ $\overset{?}{9\overline{)63}}$

$\overset{?}{9\overline{)9}}$ $\overset{?}{9\overline{)72}}$ $\overset{?}{9\overline{)18}}$ $\overset{?}{9\overline{)27}}$ $\overset{?}{9\overline{)81}}$

2. Give the quotient of each of the following examples:

$\overset{?}{9\overline{)63}}$ $\overset{?}{9\overline{)36}}$ $\overset{?}{9\overline{)54}}$ $\overset{?}{9\overline{)18}}$ $\overset{?}{9\overline{)81}}$

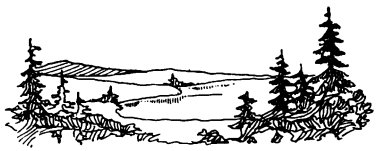
$\overset{?}{9\overline{)45}}$ $\overset{?}{9\overline{)72}}$ $\overset{?}{9\overline{)27}}$ $\overset{?}{9\overline{)90}}$ $\overset{?}{9\overline{)9}}$

3. Find one-ninth of 72; 63; 18; 90; 36.
4. Find $\frac{1}{9}$ of 9; 27; 81; 45; 54.

Exercise 87—Oral.

First say which kind of a division example each is, then give the answer:

1. When Arvid's father was 36 years old, he was just 9 times as old as Arvid; how old was Arvid?
2. How many \$5. chairs can be bought for \$45.?
3. What is one-ninth of 90 minutes?
4. How many oranges are there in $1\frac{1}{2}$ doz.?
5. 2 is what part of $1\frac{1}{2}$ doz.?
6. If one and one-half dozen oranges cost 45¢, how many can be bought for 5¢?
7. If there are 54 passengers in a railroad coach and $\frac{1}{9}$ of them get off at the first stop, how many remain in the coach?
8. What is the difference between the price of two desks, one costing \$18.00, and the other costing $\frac{1}{9}$ less?
9. A balloon which carried 63 pounds of ballast had to drop $\frac{1}{9}$ of the ballast; how many pounds of ballast were dropped? How many pounds remained?



WRITTEN MULTIPLICATION

LESSON 48

No Carrying Figures

EXAMPLE: $123 \times 2 = ?$

$$\begin{array}{r} 123 \\ \times\ \ 2 \\ \hline 246 \end{array}$$

The product is 246 because 3 units multiplied by 2 = 6 units; 2 tens multiplied by 2 = 4 tens; 1 hundred multiplied by 2 = 2 hundreds; answer, 246.

As you know, multiplication is a short method of adding any number a given number of times; $9 \times 9 = 81$ because $9 + 9 + 9 + 9 + 9 + 9 + 9 + 9 + 9 = 81$; there are 8 tens and 1 unit in the answer of the multiplication for exactly the same reason that there are 8 tens and 1 unit in the answer of the addition.

Now, we will say that you are adding $10 + 10 + 10 + 10 = 40$; you answer is 4 tens and 0 units because you have added 1 ten and 0 units four times. If this same example is done by multiplication, your answer must be exactly the same, because 10×4 is also 1 ten and 0 units four times, which is 4 tens and 0 units or 40.

From these examples you can easily see that what you have learned in addition about the sum of units being units, the sum of tens being tens, and the sum of hundreds being hundreds, is also to be used in multiplication for exactly the same reasons as in addition.

For the present, prove your answers by making an addition example for each multiplication example.

Exercise 88—Written.

Copy, find the product, and prove each of the following examples:

	1.	2.	3.	4.	5.	6.
Multiplicand	20	40	20	20	30	30
Multiplier	4	2	2	3	2	3
Product	80					

7.	8.	9.	10.	11.	12.
100	100	200	200	200	300
3	8	2	3	4	2

13.	14.	15.	16.	17.	18.
300	42	22	23	24	31
3	2	4	3	2	3

19.	20.	21.	22.	23.	24.
32	33	34	43	120	230
3	3	2	2	4	3

25.	26.	27.	28.	29.	30.
330	240	430	410	310	320
3	2	2	2	3	3

31.	32.	33.	34.	35.	36.
220	110	121	231	243	323
4	8	4	3	2	3

37.	38.	39.	40.	41.	42.
114	134	111	222	333	444
2	2	9	4	3	2

43.	44.	45.	46.	47.	48.	49.	50.
101	202	303	404	102	203	304	103
8	4	3	2	4	3	2	3

Lesson 49

Carrying Figures

Always multiply units first, then tens, then hundreds, for the same reasons that in addition you add units first, then tens, then hundreds.

When the product of the units is more than 9, carry and add the tens in this product to the product of the tens, just as you carry and add the tens when the sum of the units is more than 9 in addition.

Work Example 1 very carefully, and be sure that you understand it thoroughly.

When the product of the tens is more than 9, carry and add the hundreds in this product to the product of the hundreds, just as you carry and add the hundreds when the sum of the tens is more than 9 in addition.

Work Examples 2 and 3 very carefully.

Exercise 89—Written.

EXAMPLE 1: $24 \times 3 = ?$

24	24
3	3
12	72
60	
72	

The product is 72 because 4 units $\times$ 3 = 12 units; write 2 in units' place and carry 1 ten to tens' place; 2 tens $\times$ 3 = 6 tens; 6 tens + 1 ten carried from units' place = 7 tens; write 7 tens in tens' place; answer, 72.

WRITTEN MULTIPLICATION

Copy, find the product, and prove each of the following examples:

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
14	15	17	18	19	23	24	25	28	36	45	48
3	5	4	3	4	4	3	3	3	2	2	2

EXAMPLE 2: $43 \times 3 = ?$

$$\begin{array}{r} 43 \\ \times\ 3 \\ \hline 129 \end{array}$$

The product is 129 because 3 units $\times$ 3 = 9 units; write 9 in units' place; 4 tens $\times$ 3 = 12 tens; write 2 in tens' place and 1 in hundreds' place; answer, 129.

Copy, find the product, and prove each of the following examples:

13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.
32	43	40	70	52	63	72	91	82	73	62	81
4	3	4	7	3	3	4	9	4	3	4	9

EXAMPLE 3: $45 \times 3 = ?$

$$\begin{array}{r} 45 \\ \times\ 3 \\ \hline 135 \end{array}$$

The product is 135 because 5 units $\times$ 3 = 15 units; write 5 in units' place and carry 1 ten to tens' place; 4 tens $\times$ 3 = 12 tens; 12 tens + 1 ten carried from units' place = 13 tens; write 3 in tens' place and 1 in hundreds' place; answer, 135.

Copy, find the product, and prove each of the following examples:

25.	26.	27.	28.	29.	30.	31.	32.	33.	34.	35.	36.
46	38	73	86	94	87	58	39	47	28	63	99
4	5	6	7	8	9	9	8	7	6	5	9

Exercise 90—Written.

EXAMPLE: $127 \times 3 = ?$

$$\begin{array}{r} 127 \\ \times\ 3 \\ \hline 381 \end{array}$$

The product is 381 because 7 units × 3 = 21 units; write 1 in units' place and carry 2 tens to tens' place; 2 tens × 3 = 6 tens; 6 tens + 2 tens carried from units' place = 8 tens; write 8 in tens' place; 1 hundred × 3 = 3 hundreds; write 3 in hundreds' place; answer, 381.

Copy, find the product, and prove each of the following examples:

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
126	118	137	146	239	116	123	237	349	248
× 3	× 5	× 2	× 2	× 2	× 5	× 4	× 2	× 2	× 2

EXAMPLE: $143 \times 3 = ?$

$$\begin{array}{r} 143 \\ \times\ 3 \\ \hline 429 \end{array}$$

The product is 429 because 3 units × 3 = 9 units; write 9 in units' place; 4 tens × 3 = 12 tens; write 2 in tens' place and carry 1 hundred to hundreds' place; 1 hundred × 3 = 3 hundreds; 3 hundreds + 1 hundred carried from tens' place = 4 hundreds; write 4 in hundreds' place; answer, 429.

Copy, find the product, and prove each of the following examples:

11.	12.	13.	14.	15.	16.	17.	18.	19.	20.
142	181	172	183	162	243	371	192	284	193
× 4	× 5	× 4	× 3	× 2	× 3	× 2	× 4	× 2	× 3

WRITTEN MULTIPLICATION

EXAMPLE: $177 \times 4 = ?$

$$\begin{array}{r} 177 \\ \times\ 4 \\ \hline 708 \end{array}$$

The product is 708 because 7 units × 4 = 28 units; write 8 in units' place and carry 2 tens to tens' place; 7 tens × 4 = 28 tens; 28 tens + 2 tens carried from units' place = 30 tens; write 0 in tens' place and carry 3 hundreds to hundreds' place; 1 hundred × 4 = 4 hundreds; 4 hundreds + 3 hundreds carried from tens' place = 7 hundreds; write 7 in hundreds' place; answer, 708.

Copy, find the product, and prove each of the following examples:

21.	22.	23.	24.	25.	26.	27.	28.	29.	30.
189	275	186	198	178	176	158	289	367	489
× 3	× 3	× 4	× 5	× 5	× 4	× 3	× 3	× 2	× 2

EXAMPLE: $305 \times 3 = ?$

$$\begin{array}{r} 305 \\ \times\ 3 \\ \hline 915 \end{array}$$

The product is 915 because 5 units × 3 = 15 units; write 5 in units' place and carry 1 ten to tens' place; 0 tens × 3 = 0 tens; 0 tens + 1 ten carried from units' place = 1 ten; write 1 in tens' place; 3 hundreds × 3 = 9 hundreds; write 9 in hundreds' place; answer, 915.

Copy, find the product, and prove each of the following examples:

31.	32.	33.	34.	35.	36.	37.	38.	39.	40.
206	408	307	209	308	109	107	205	409	208
× 4	× 2	× 3	× 4	× 3	× 9	× 8	× 4	× 2	× 4

LESSON 50

Dollars and Cents

EXAMPLE: $5.32 × 5 = ?

$5.32
5
$26.60

The answer is $26.60 because 2 cents × 5 = 10 cents; write 0 in cents' place and carry 1 dime to dimes' place; 3 dimes × 5 = 15 dimes; 15 dimes + 1 dime carried from cents' place = 16 dimes; write 6 in dimes' place and carry 1 dollar to dollars' place; 5 dollars × 5 = 25 dollars; 25 dollars + 1 dollar from dimes' place = 26 dollars; answer, $26.60.

When the multiplicand contains cents or cents and dollars, the product will contain cents or cents and dollars; therefore, the period which is used in the multiplicand must also be used in the product. To make your work easier, always write the smaller number under the larger number, but remember that the multiplicand is always the number that is to be repeated, whether it is the smaller or the larger number.

Exercise 91—Oral and Written.

A. Tell just how you would work each of these examples. Do not solve them at this time. Tell which number is the multiplicand, which number is the multiplier, and which number will be placed below in working the example.

1. Anna had $4.50 in her savings bank, and Dorothy had 3 times that much; how much had Dorothy?

2. David saved $6.14 in one year while his brother Andrew saved 4 times that much; how much did Andrew save? How much more was that than David saved?
3. Find the total cost of this merchandise:

   3 Rugs @ $6.50 = ?
   4 Chairs @ $3.40 = ?
   8 Tables @ $9.35 = ?
   ?

4. How many ounces are there in 9 pounds? How much will that many ounces of butter cost @ 2¢ an ounce?
5. What is the cost of 149# of sugar @ 6¢ per lb.?
6. If William can save 3 times as fast as his friend August, how much will William save while August saves $2.88?
7. What is the cost of 6 sets of books @ $4.98 per set?
8. What is the cost of 8 lamps @ $8.39 each?
9. If the price of coal is changed from $4.90 to $6.35 a ton, what is the total difference in the cost of 9 tons?
10. If the price of rugs is changed from $22.50 to $36.00 each, what is the total difference in the cost of 7 rugs?

B. Now work all of these examples.

WRITTEN DIVISION

LESSON 51

The Formation of the Remainder

If you were asked: "How many 4's are there in 4?", you would quickly say "One" which, of course, is correct. Now, who can answer this: "How many 4's are there in 7?" We know that there is at least one 4 in 7, but can we find *more* than one 4 in 7? Let us use our Division Table of 4's to find out:

There is one 4 in 4,
There are two 4's in 8,
etc.

This shows us that there is only one 4 in 7 because the dividend would have to be at least 8 before we could find two 4's in it; but when we take one 4 out of 7 we still have a remainder of 3, so our answer is "1 and 3 remainder" which is usually written "1 and 3 rem." The example, therefore, is worked like this:

EXAMPLE: $7 \div 4 = ?$

Think This:	**But Write Only This:**
1 and 3 rem.	1 and 3 rem.
$4\overline{)7}$	$4\overline{)7}$
$\underline{4}$	
3	

We find that 4 can be taken out of 7 units once only, but that there are 3 units remaining undivided; answer, 1 and 3 rem.

Note: Study this example very carefully till you can see just why $7 \div 4 = 1$ and 3 rem.

Exercise 92—Oral.

1. Say the division table of 2's.
2. In what number will you find exactly one 5? Five 5's? Three 5's? Six 5's? Two 5's? Four 5's? Eight 5's? Seven 5's? Nine 5's?
3. How many 4's are there in 16? In 36? 8? 12? 20? 4? 24? 32? 28?
4. How many 3's will you find in 27? How many in 6? 15? 21? 12? 3? 18? 24? 9?
5. In what number will you find exactly three 6's? Seven 6's? Four? Two? Eight? One? Five? Six? Nine?
6. How many 9's are there in 36? In 63? 81? 9? 45? 72? 18? 54? 27?
7. Say the division table of 7's.
8. In what number will you find exactly seven 8's? Four 8's? Eight? One? Six? Two? Five? Three? Nine?
9. Think in the division table of 5's; what number between 8 and 13 contains 5 exactly? Between 21 and 29? Between 44 and 48?
10. How many 3's are there in 12? Is there any remainder? How many in 13? Any remainder? In 14? Any remainder? In 15? Any remainder?
11. Tell the number of 4's there are in each of the following numbers, also tell what remainder there is, if any:

    8; 9; 10; 11; 12; 15; 17; 19; 20.

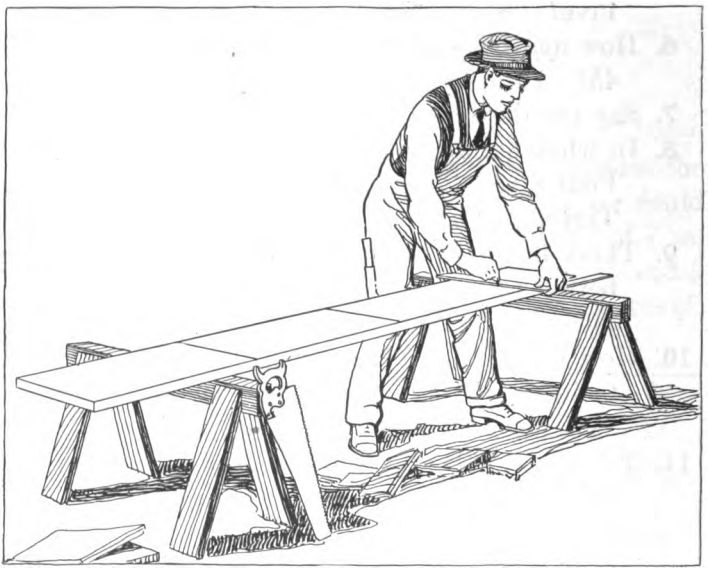
12. Tell how many 6's there are in each number from 1 to 20, and give the remainder, if any. From 21 to 40. From 41 to 59.

13. Tell how many 8's there are in each number from 1 to 27, and give the remainder, if any. From 28 to 56. From 57 to 79.

14. Tell how many 7's there are in each number from 1 to 23, and give the remainder, if any. From 24 to 47. From 48 to 69.

15. Tell how many 9's there are in each number from 31 to 60, and give the remainder, if any.

16. A grocer had 19 pounds of sugar to put up in two-pound packages; how many packages could he make and what remainder had he?



17. A carpenter needed several boards each 3 feet long; how many could he cut from a board 10 feet long, and what remainder had he?

18. Jane had a bolt of ribbon 83 inches long which she wanted to cut into pieces 9 inches long; how many pieces did she get, and what remainder had she?

19. A paper-box maker had 56 empty boxes to deliver and put them up in bundles of 6 boxes each; how many bundles were there, and what remainder had he?

20. A gardener put his empty flower pots away in stacks of 8; he had 63 flower pots to put away; how many stacks were there, and what remainder had he?

21. A boy had 30 books to put on shelves but found that each shelf would hold only 7 books; how many shelves did he fill, and what remainder had he?

22. If oranges cost 5¢ each, how many can you buy for 39¢, and how much money will remain?

23. If cabbages cost 9¢ each, how many can you buy for 80¢, and how much money will remain?

24. If salt costs 6¢ a pound, how many pounds can you buy for 47¢, and how much money will remain?

25. If flour costs 7¢ per pound, how many pounds can you buy for 61¢, and how much money will remain?

26. A fruit dealer had 8 bags full of oranges and 3 oranges more; if each bag contained 9 oranges, how many where there in all?

27. Can you make two good division examples out of Question 26? Try!

28. A coal dealer delivered 7 full loads of coal and 6 tons more; if a full load weighed 8 tons, how many tons were there in all?

29. Make two good division examples out of Question 28.

30. Make up a good multiplication example like Question 28. Now make two good division examples out of your multiplication example.

Exercise 93—Written.

EXAMPLE: $22 \div 3 = ?$

Think This:	But Write Only This:
7 and 1 rem.	7 and 1 rem.
$3\overline{)22}$	$3\overline{)22}$
21	
1	

2 tens cannot be divided by 3, but are changed into units and added to the other units in the dividend, making 22 units; 22 units divided by 3 = 7 units with 1 unit remaining undivided; answer, 7 and 1 rem.

Copy, and find the quotient of each of the following examples:

1.	**2.**	**3.**	**4.**	**5.**	**6.**	**7.**
?	?	?	?	?	?	?
$4\overline{)38}$	$5\overline{)33}$	$6\overline{)46}$	$7\overline{)61}$	$8\overline{)69}$	$9\overline{)79}$	$9\overline{)75}$
8.	**9.**	**10.**	**11.**	**12.**	**13.**	**14.**
?	?	?	?	?	?	?
$8\overline{)79}$	$7\overline{)47}$	$6\overline{)58}$	$5\overline{)48}$	$4\overline{)31}$	$3\overline{)20}$	$2\overline{)19}$

15. $27 \div 4 = ?$
16. $29 \div 5 = ?$
17. $14 \div 3 = ?$
18. $36 \div 7 = ?$
19. $28 \div 6 = ?$
20. $24 \div 9 = ?$
21. $57 \div 8 = ?$
22. $15 \div 2 = ?$

23. $35 \div 8 = ?$	**27.** $58 \div 7 = ?$
24. $38 \div 5 = ?$	**28.** $17 \div 3 = ?$
25. $65 \div 9 = ?$	**29.** $22 \div 4 = ?$
26. $11 \div 2 = ?$	**30.** $43 \div 6 = ?$

LESSON 52

Dividends to 99

No Changing—No Remainders

EXAMPLE: $60 \div 2 = ?$

MULTIPLICATION

$$\begin{array}{r} 30 \\ \times\ 2 \\ \hline 60 \end{array}$$

The product is 60 because 0 units × 2 = 0 units; 3 tens × 2 = 6 tens; answer, 60.

This shows us why $60 \div 2 = 30$, and proves that the answer found by division is correct.

DIVISION

Think This:	But Write Only This:
30	30
2)60	2)60
6	
0	
0	

The quotient is 30 because 6 tens ÷ 2 = 3 tens; 0 units ÷ 2 = 0 units; answer, 30.

The proof is $30 \times 2 = 60$ as shown above.

Just as 6 units ÷ 2 = 3 units, so 6 tens ÷ 2 = 3 tens; therefore, when there is a quotient found by dividing tens it is always written in tens' place, and when there is a quotient found by dividing units, it is always written in units' place.

The figure 0 is always written in the quotient when the divisor cannot be taken out of the corresponding figure in the dividend, but we never begin a number with the figure 0.

EXAMPLE: $64 \div 2 = ?$

MULTIPLICATION

$$\begin{array}{r} 32 \\ \times\ 2 \\ \hline 64 \end{array}$$

The product is 64 because 2 units $\times 2 = 4$ units; 3 tens $\times 2 = 6$ tens; answer, 64.

This shows us why $64 \div 2 = 32$, and proves that the answer found by division is correct.

DIVISION

Think This:	But Write Only This:
$\begin{array}{r} 32 \\ 2\overline{)64} \\ 6 \\ \hline 4 \\ 4 \\ \hline \end{array}$	$\begin{array}{r} 32 \\ 2\overline{)64} \end{array}$

The quotient is 32 because 6 tens $\div 2 = 3$ tens; 4 units $\div 2 = 2$ units; answer, 32.

The proof is $32 \times 2 = 64$ as shown above.

When there are both tens and units in the dividend, divide first the tens and then the units because we always start with the left-hand figure of the dividend and divide each figure in its turn, writing each figure of the quotient in its proper place.

Always think in the division table of the divisor; to divide by 6, think in the table of 6's; etc.

To prove your answer, multiply the quotient by the divisor because the product of these should equal the dividend, for, as you know, division is the reverse of multiplication.

Exercise 94—Written.

Copy, find the quotient, and prove each of the following examples:

1.	2.	3.	4.	5.	6.
$?$	$?$	$?$	$?$	$?$	$?$
$4\overline{)80}$	$2\overline{)80}$	$2\overline{)40}$	$4\overline{)40}$	$3\overline{)60}$	$2\overline{)60}$

7. $90 \div 3 = ?$
8. $20 \div 2 = ?$
9. $60 \div 3 = ?$
10. $80 \div 8 = ?$
11. $40 \div 2 = ?$
12. $90 \div 3 = ?$
13. $30 \div 3 = ?$
14. $80 \div 4 = ?$

15.	16.	17.	18.	19.	20.	21
?	?	?	?	?	?	?
$2\overline{)84}$	$4\overline{)88}$	$3\overline{)69}$	$2\overline{)48}$	$3\overline{)93}$	$3\overline{)96}$	$3\overline{)99}$

22. $68 \div 2 = ?$
23. $86 \div 2 = ?$
24. $88 \div 2 = ?$
25. $77 \div 7 = ?$
26. $99 \div 9 = ?$
27. $66 \div 6 = ?$

28.	29.	30.	31.	32.	33.	34.
?	?	?	?	?	?	?
$2\overline{)24}$	$3\overline{)66}$	$4\overline{)44}$	$2\overline{)46}$	$2\overline{)62}$	$3\overline{)63}$	$2\overline{)42}$

35. $55 \div 5 = ?$
36. $64 \div 2 = ?$
37. $26 \div 2 = ?$
38. $99 \div 9 = ?$
39. $48 \div 2 = ?$
40. $22 \div 2 = ?$

41. A steamfitter cut 39 feet of pipe into 3-foot pieces; how many pieces were there?
42. A picture-frame maker cut 84 feet of moulding into pieces each 4 feet long, how many pieces were there when he finished?
43. A paperhanger who was papering a wall 46 feet long, used strips 2 feet wide; how many strips of paper did he need?
44. A carpet manufacturer who wanted to ship 69 carpets, tied them in bundles of 3 carpets each; how many bundles did he ship?
45. In a shipment of 88 pairs of shoes, $\frac{1}{4}$ of the shoes were button shoes; how many pairs of button shoes were there?

LESSON 53

Dividends to 99
Changing and Remainders

EXAMPLE: $72 \div 3 = ?$

MULTIPLICATION

$$\begin{array}{r} 24 \\ \times\ 3 \\ \hline 72 \end{array}$$

The product is 72 because 4 units × 3 = 12 units; write 2 in units' place and carry 1 ten to tens' place; 2 tens × 3 = 6 tens; 6 tens + 1 ten carried from units' place = 7 tens; write 7 in tens' place; answer, 72.

This shows us why $72 \div 3 = 24$, and proves that the answer found by division is correct.

DIVISION

Think This:	But Write Only This:
$\begin{array}{r} 24 \\ 3\overline{)72} \\ 6 \\ \hline 12 \\ 12 \\ \hline \end{array}$	$\begin{array}{r} 24 \\ 3\overline{)72} \end{array}$

The quotient is 24 because 7 tens ÷ 3 = 2 tens with 1 ten remaining to be changed into units to be added to the other units in the dividend; 12 units ÷ 3 = 4 units; answer, 24.

The proof is $24 \times 3 = 72$ as shown above.

When the divisor has been taken out of the tens as many times as possible, any tens that are left undivided must be changed into units and added to the other units in the dividend before taking the divisor out of the units.

Practice Exercise:

Say how many tens are left undivided:

$52 \div 2$; $54 \div 3$; $72 \div 4$; $38 \div 2$;
$64 \div 4$; $75 \div 5$; $96 \div 6$; $95 \div 5$.

EXAMPLE: $97 \div 3 = ?$

MULTIPLICATION

$$\begin{array}{r} 32 \\ \times 3 \\ \hline 96 \\ +1 \\ \hline 97 \end{array}$$

The answer is 97 because the product of 32×3 is 96 and we must add 1 to 96 to make 97. 2 units $\times 3 = 6$ units; 3 tens $\times 3 = 9$ tens; product, 96; $96 + 1 = 97$; answer, 97.

This shows us why $97 \div 3 = 32$ and 1 rem., and proves that the answer found by division is correct.

DIVISION

Think This:	But Write Only This:
32 and 1 rem.	32 and 1 rem.
3)97	3)97
9	
7	
6	
1	

The quotient is 32 and 1 rem. because 9 tens $\div 3 = 3$ tens; 7 units $\div 3 = 2$ units with 1 unit remaining undivided; answer, 32 and 1 rem.

The proof is $32 \times 3 + 1 = 97$ as shown above.

When the divisor has been taken out of the units as many times as possible, any units that are left undivided form the remainder. This remainder is written after the quotient but is separated from it by the word "and."

In proving examples with remainders, we must multiply the quotient by the divisor just as before, then add the remainder to the product so found.

Practice Exercise:

Say how many units are left undivided in each of these examples:

$25 \div 2$;	$49 \div 2$;	$35 \div 3$;	$67 \div 3$;
$47 \div 4$;	$52 \div 5$;	$59 \div 5$;	$65 \div 6$;
$67 \div 6$;	$76 \div 7$;	$85 \div 4$;	$96 \div 9$.

EXAMPLE: $73 \div 3 = ?$

MULTIPLICATION

$$\begin{array}{r} 24 \\ \times 3 \\ \hline 72 \\ +1 \\ \hline 73 \end{array}$$

The answer is 73 because the product of 24×3 is 72 and we must add 1 to 72 to make 73. 4 units $\times$ 3 = 12 units; write 2 in units' place and carry 1 ten to tens' place; 2 tens $\times$ 3 = 6 tens; 6 tens + 1 ten carried from units' place = 7 tens; write 7 in tens' place; product, 72; $72 + 1 = 73$; answer, 73. This shows us why $73 \div 3 =$ 24 and 1 rem., and proves that the answer found by division is correct.

DIVISION

Think This:	**But Write Only This:**
24 and 1 rem.	24 and 1 rem.
3)73	3)73
6	
13	
12	
1	

The quotient is 24 and 1 rem. because 7 tens $\div$ 3 = 2 tens with 1 ten remaining to be changed into units to be added to the other units in the dividend; 13 units $\div$ 3 = 4 units with 1 unit remaining undivided; answer, 24 and 1 rem.

The proof is $24 \times 3 + 1 = 73$ as shown above.

Exercise 95—Written.

Copy, find the quotient, and prove each of the following examples:

1.	**2.**	**3.**	**4.**	**5.**
?	?	?	?	?
3)42	5)70	3)84	2)72	2)90

6.	7.	8.	9.	10.
?	?	?	?	?
$2\overline{)96}$	$4\overline{)60}$	$5\overline{)65}$	$8\overline{)96}$	$7\overline{)84}$

11. $85 \div 2 = ?$	**26.** $70 \div 3 = ?$
12. $89 \div 4 = ?$	**27.** $80 \div 7 = ?$
13. $67 \div 3 = ?$	**28.** $89 \div 6 = ?$
14. $37 \div 3 = ?$	**29.** $90 \div 8 = ?$
15. $49 \div 4 = ?$	**30.** $91 \div 5 = ?$
16. $67 \div 6 = ?$	**31.** $87 \div 5 = ?$
17. $89 \div 8 = ?$	**32.** $93 \div 5 = ?$
18. $47 \div 4 = ?$	**33.** $70 \div 6 = ?$
19. $79 \div 7 = ?$	**34.** $93 \div 8 = ?$
20. $58 \div 5 = ?$	**35.** $81 \div 5 = ?$
21. $69 \div 4 = ?$	**36.** $93 \div 4 = ?$
22. $55 \div 3 = ?$	**37.** $97 \div 8 = ?$
23. $77 \div 4 = ?$	**38.** $72 \div 5 = ?$
24. $94 \div 4 = ?$	**39.** $90 \div 7 = ?$
25. $73 \div 3 = ?$	**40.** $57 \div 4 = ?$

Exercise 96—Oral and Written.

1. $21 \times 3 = ?$ Make up a good multiplication example using these numbers. Read your example to the class. What is your answer?
2. Now make a good division example out of your multiplication example. Read your example to the class. What is your answer?
3. Farmer Jones was tying radishes in bunches containing 8 radishes to the bunch. How many bunches could he make from 97 radishes? How many radishes remained untied?

4. Now make a good multiplication problem out of Farmer Jones' division problem. Read your problem to the class. What is your answer?

5. How many 6-pound sacks of salt can be filled from a bin holding 75 pounds? How many pounds will remain in the bin? How many pounds are needed to finish filling another sack?
6. William's mother sent him to the store with 80¢ to buy bread at 7¢ a loaf; how many loaves could he buy? How much money had he left?
7. John bought apples at 2¢ each; how many did he get for 58¢?
8. Some boy scouts walked to a camp 23 miles away; if they walked 3 miles every hour, how far had they still to walk at the end of 7 hours?

9. The boat called "Lightning" makes a trip of 74 miles every day, and travels at the rate of 9 miles an hour; how many miles has it still to go at the end of 8 hours of traveling?
10. A magazine salesman makes calls at the rate of 7 an hour; if he must make 50 calls a day, how many calls has he still to make after working 6 hours?

LESSON 54

Dividends to 999

No Changing—No Remainders

EXAMPLE: $600 \div 2 = ?$

MULTIPLICATION

$$\begin{array}{r} 300 \\ \times\ 2 \\ \hline 600 \end{array}$$

The product is 600 because 0 units × 2 = 0 units; 0 tens × 2 = 0 tens; 3 hundreds × 2 = 6 hundreds; answer, 600.

This shows us why $600 \div 2 = 300$, and proves that the answer found by division is correct.

DIVISION

Think This:	But Write Only This:
300	300
$2\overline{)600}$	$2\overline{)600}$
6	
0	
0	
0	
0	

The quotient is 300 because 6 hundreds ÷ 2 = 3 hundreds; 0 tens ÷ 2 = 0 tens; 0 units ÷ 2 = 0 units; answer, 300.

The proof is 300 × 2 = 600 as shown above.

In the same way as dividing units gives us a quotient in units' place, and dividing tens gives us a quotient in tens' place, so dividing hundreds gives us a quotient in hundreds' place.

EXAMPLE: $464 \div 2 = ?$

MULTIPLICATION

$$\begin{array}{r} 232 \\ \times\ 2 \\ \hline 464 \end{array}$$

The product is 464 because 2 units $\times$ 2 = 4 units; 3 tens $\times$ 2 = 6 tens; 2 hundreds $\times$ 2 = 4 hundreds; answer, 464.

This shows us why $464 \div 2 = 232$, and proves that the answer found by division is correct.

DIVISION

Think This:	But Write Only This:
$\begin{array}{r} 232 \\ 2\overline{)464} \\ 4 \\ \hline 6 \\ 6 \\ \hline 4 \\ 4 \\ \hline \end{array}$	$\begin{array}{r} 232 \\ 2\overline{)464} \end{array}$

The quotient is 232 because 4 hundreds $\div$ 2 = 2 hundreds; 6 tens $\div$ 2 = 3 tens; 4 units $\div$ 2 = 2 units; answer, 232.

The proof is $232 \times 2 = 464$ as shown above.

As before, we must start with the left-hand figure of the dividend and divide each figure in its turn.

Exercise 97—Written.

Copy, find the quotient, and prove each of the following examples:

1.	**2.**	**3.**	**4.**	**5.**
$3\overline{)300}$	$4\overline{)800}$	$2\overline{)400}$	$3\overline{)600}$	$8\overline{)800}$
6.	**7.**	**8.**	**9.**	**10.**
$2\overline{)600}$	$3\overline{)300}$	$2\overline{)200}$	$3\overline{)900}$	$4\overline{)400}$

11. $480 \div 4 = ?$
12. $690 \div 3 = ?$
13. $990 \div 3 = ?$
14. $480 \div 2 = ?$
15. $860 \div 2 = ?$
16. $820 \div 2 = ?$
17. $930 \div 3 = ?$
18. $960 \div 3 = ?$

19. 880 ÷ 4 = ?	**30.** 888 ÷ 4 = ?
20. 880 ÷ 8 = ?	**31.** 909 ÷ 3 = ?
21. 484 ÷ 4 = ?	**32.** 808 ÷ 2 = ?
22. 693 ÷ 3 = ?	**33.** 408 ÷ 4 = ?
23. 486 ÷ 2 = ?	**34.** 609 ÷ 3 = ?
24. 909 ÷ 3 = ?	**35.** 608 ÷ 2 = ?
25. 228 ÷ 2 = ?	**36.** 309 ÷ 3 = ?
26. 208 ÷ 2 = ?	**37.** 408 ÷ 2 = ?
27. 999 ÷ 9 = ?	**38.** 208 ÷ 2 = ?
28. 888 ÷ 8 = ?	**39.** 806 ÷ 2 = ?
29. 999 ÷ 3 = ?	**40.** 906 ÷ 3 = ?

LESSON 55

Dividends to 999

Changing and Remainders

EXAMPLE: 160 ÷ 4 = ?

MULTIPLICATION

$$\begin{array}{r} 40 \\ \times\ 4 \\ \hline 160 \end{array}$$

The product is 160 because 0 units × 4 = 0 units; 4 tens × 4 = 16 tens; write 6 tens in tens' place and write 1 hundred in hundreds' place; answer, 160.

This shows us why 160 ÷ 4 = 40, and proves that the answer found by division is correct.

DIVISION

Think This:	But Write Only This:
40	40
4)160	4)160
16	
0	
0	

The quotient is 40 because 1 hundred cannot be divided by 4, but must be changed into tens and added to the 6 tens in the dividend making 16 tens; 16 tens ÷ 4 = 4 tens; 0 units ÷ 4 = 0 units; answer, 40.

The proof is 40 × 4 = 160 as shown above.

When the divisor has been taken out of the hundreds as many times as possible, any hundreds that are left undivided must be changed into tens and added to the other tens in the dividend before taking the divisor out of the tens; the dividing must then continue just as before.

Exercise 98—Written.

Copy, find the quotient, and prove each of the following examples:

1. $420 \div 7 = ?$
2. $400 \div 8 = ?$
3. $250 \div 5 = ?$
4. $720 \div 9 = ?$
5. $300 \div 6 = ?$
6. $270 \div 3 = ?$
7. $100 \div 2 = ?$
8. $320 \div 4 = ?$
9. $630 \div 9 = ?$
10. $630 \div 7 = ?$

EXAMPLE: $129 \div 3 = ?$

MULTIPLICATION

$$\begin{array}{r} 43 \\ \times\ 3 \\ \hline 129 \end{array}$$

The product is 129 because 3 units $\times$ 3 = 9 units; 4 tens $\times$ 3 = 12 tens; write 2 tens in tens' place and write 1 hundred in hundreds' place; answer, 129.

This shows us why $129 \div 3 = 43$, and proves that the answer found by division is correct.

DIVISION

Think This:	But Write Only This:
43	43
3)129	3)129
12	
9	
9	

The quotient is 43 because 1 hundred cannot be divided by 3, but must be changed into tens and added to the 2 tens in the dividend making 12 tens; 12 tens $\div$ 3 = 4 tens; 9 units $\div$ 3 = 3 units; answer, 43.

The proof is 43 $\times$ 3 = 129 as shown above.

11. $189 \div 3 = ?$
12. $728 \div 8 = ?$
13. $208 \div 4 = ?$
14. $729 \div 9 = ?$
15. $288 \div 4 = ?$
16. $648 \div 8 = ?$
17. $306 \div 6 = ?$
18. $639 \div 9 = ?$
19. $567 \div 7 = ?$
20. $276 \div 3 = ?$

EXAMPLE: $365 \div 5 = ?$

MULTIPLICATION

$$\begin{array}{r} 73 \\ \times\ 5 \\ \hline 365 \end{array}$$

The product is 365 because 3 units $\times$ 5 = 15 units; write 5 in units' place and carry 1 ten to tens' place; 7 tens $\times$ 5 = 35 tens; 35 tens + 1 ten carried from units' place = 36 tens; write 6 in tens' place and write 3 in hundreds' place; answer, 365.

This shows us why $365 \div 5 = 73$, and proves that the answer found by division is correct.

DIVISION

Think This:	But Write Only This:
73	73
5)365	5)365
35	
15	
15	

The quotient is 73 because 3 hundreds cannot be divided by 5, but must be changed into tens and added to the 6 tens in the dividend making 36 tens; 36 tens $\div$ 5 = 7 tens with 1 ten remaining to be changed into units to be added to the other units in the dividend; 15 units $\div$ 5 = 3 units; answer, 73.

The proof is 73 $\times$ 5 = 365 as shown above.

21. $438 \div 6 = ?$
22. $329 \div 7 = ?$
23. $108 \div 6 = ?$
24. $736 \div 8 = ?$
25. $837 \div 9 = ?$
26. $304 \div 4 = ?$
27. $315 \div 5 = ?$
28. $704 \div 8 = ?$
29. $801 \div 9 = ?$
30. $294 \div 3 = ?$

EXAMPLE: $289 \div 4 = ?$

MULTIPLICATION

$$\begin{array}{r} 72 \\ \times 4 \\ \hline 288 \\ +1 \\ \hline 289 \end{array}$$

The answer is 289 because the product of 72×4 is 288, and we must add 1 to 288 to make 289. 2 units $\times$ 4 = 8 units; 7 tens $\times$ 4 = 28 tens; write 8 in tens' place and write 2 in hundreds' place; product, 288; 288 + 1 = 289; answer, 289.

This shows us why $289 \div 4 =$ 72 and 1 rem., and proves that the answer found by division is correct.

DIVISION

Think This:	**But Write Only This:**
72 and 1 rem.	72 and 1 rem.
4)289	4)289
28	
9	
8	
1	

The quotient is 72 and 1 rem. because 2 hundreds cannot be divided by 4, but must be changed into tens and added to the 8 tens in the dividend making 28 tens; 28 tens $\div$ 4 = 7 tens; 9 units $\div$ 4 = 2 units with 1 unit remaining undivided; answer, 72 and 1 rem.

The proof is $72 \times 4 + 1 =$ 289 as shown above.

31. $327 \div 4 = ?$
32. $249 \div 6 = ?$
33. $409 \div 8 = ?$
34. $125 \div 3 = ?$
35. $493 \div 7 = ?$
36. $358 \div 5 = ?$
37. $814 \div 9 = ?$
38. $187 \div 2 = ?$
39. $249 \div 4 = ?$
40. $639 \div 7 = ?$
41. $192 \div 5 = ?$
42. $605 \div 7 = ?$
43. $755 \div 8 = ?$
44. $786 \div 9 = ?$
45. $317 \div 5 = ?$
46. $310 \div 8 = ?$

EXAMPLE: $187 \div 4 = ?$

MULTIPLICATION

$$\begin{array}{r} 46 \\ \times 4 \\ \hline 184 \\ +3 \\ \hline 187 \end{array}$$

The answer is 187 because the product of $46 \times 4 = 184$, and we must add 3 to 184 to make 187. 6 units $\times$ 4 = 24 units; write 4 in units' place and carry 2 tens to tens' place; 4 tens $\times$ 4 = 16 tens; 16 tens + 2 tens carried from units' place = 18 tens; write 8 in tens' place and write 1 in hundreds' place; product, 184; 184 + 3 = 187; answer, 187.

This shows us why $187 \div 4 =$ 46 and 3 rem., and proves that the answer found by division is correct.

DIVISION

Think This: 46 and 3 rem.	**But Write Only This:** 46 and 3 rem.
4)187	4)187
16	
27	
24	
3	

The quotient is 46 and 3 rem. because 1 hundred cannot be divided by 4, but must be changed into tens and added to the 8 tens in the dividend making 18 tens; 18 tens $\div$ 4 = 4 tens with 2 tens remaining to be changed into units to be added to the other units in the dividend; 27 units $\div$ 4 = 6 units with 3 units remaining undivided; answer, 46 and 3 rem.

The proof is $46 \times 4 + 3 =$ 187 as shown above.

47. $896 \div 9 = ?$ **49.** $420 \div 8 = ?$

48. $508 \div 9 = ?$ **50.** $550 \div 6 = ?$

Exercise 99—Written.

Copy, find the quotient, and prove each of the following examples:

EXAMPLE: $382 \div 3 = ?$

MULTIPLICATION

$$\begin{array}{r} 127 \\ \times 3 \\ \hline 381 \\ +1 \\ \hline 382 \end{array}$$

The answer is 382 because the product of $127 \times 3 = 381$, and we must add 1 to 381 to make 382. 7 units $\times$ 3 = 21 units; write 1 in units' place and carry 2 tens to tens' place; 2 tens $\times$ 3 = 6 tens; 6 tens + 2 tens carried from units' place = 8 tens; 1 hundred $\times$ 3 = 3 hundreds; product, 381; 381 + 1 = 382; answer, 382.

This shows us why $382 \div 3 =$ 127 and 1 rem., and proves that the answer found by division is correct.

DIVISION

Think This:	**But Write Only This:**
127 and 1 rem.	127 and 1 rem.
3)382	3)382
3	
8	
6	
22	
21	
1	

The quotient is 127 and 1 rem. because 3 hundreds $\div$ 3 = 1 hundred; 8 tens $\div$ 3 = 2 tens with 2 tens remaining to be changed into to be added to the other units in the dividend; 22 units $\div$ 3 = 7 units with 1 unit remaining undivided; answer, 127 and 1 rem.

The proof is $127 \times 3 + 1 =$ 382 as shown above.

1. $379 \div 3 = ?$
2. $593 \div 5 = ?$
3. $274 \div 2 = ?$
4. $293 \div 2 = ?$
5. $478 \div 2 = ?$
6. $584 \div 5 = ?$

7. $494 \div 4 = ?$ **9.** $699 \div 2 = ?$

8. $474 \div 2 = ?$ **10.** $496 \div 2 = ?$

EXAMPLE: $427 \div 3 = ?$

MULTIPLICATION

$$\begin{array}{r} 142 \\ \times 3 \\ \hline 426 \\ +1 \\ \hline 427 \end{array}$$

The answer is 427 because the product of $142 \times 3 = 426$, and we must add 1 to 426 to make 427. 2 units $\times$ 3 = 6 units; 4 tens $\times$ 3 = 12 tens; write 2 in tens' place and carry 1 hundred to hundreds' place; 1 hundred $\times$ 3 = 3 hundreds; 3 hundreds + 1 hundred carried from tens' place = 4 hundreds; product, 426; $426 + 1 = 427$; answer, 427. This shows us why $427 \div 3 =$ 142 and 1 rem., and proves that the answer found by division is correct.

DIVISION

Think This:	**But Write Only This:**
142 and 1 rem.	142 and 1 rem.
3)427	3)427
3	
12	
12	
7	
6	
1	

The quotient is 142 and 1 rem. because 4 hundreds $\div$ 3 = 1 hundred with 1 hundred remaining to be changed into tens to be added to the other tens in the dividend; 12 tens $\div$ 3 = 4 tens; 7 units $\div$ 3 = 2 units with 1 unit remaining undivided; answer, 142 and 1 rem.

The proof is $142 \times 3 + 1 = 427$ as shown above.

11. $569 \div 4 = ?$ **15.** $325 \div 2 = ?$

12. $907 \div 5 = ?$ **16.** $729 \div 3 = ?$

13. $688 \div 4 = ?$ **17.** $743 \div 2 = ?$

14. $549 \div 3 = ?$ **18.** $768 \div 4 = ?$

EXAMPLE: $709 \div 4 = ?$

MULTIPLICATION

$$\begin{array}{r} 177 \\ \times 4 \\ \hline 708 \\ +1 \\ \hline 709 \end{array}$$

The answer is 709 because the product of $177 \times 4 = 708$, and we must add 1 to 708 to make 709. 7 units $\times$ 4 = 28 units; write 8 in units' place and carry 2 tens to tens' place; 7 tens $\times$ 4 = 28 tens; 28 tens + 2 tens carried from units' place = 30 tens; write 0 in tens' place and carry 3 hundreds to hundreds' place; 1 hundred $\times$ 4 = 4 hundreds; 4 hundreds + 3 hundreds carried from tens' place = 7 hundreds; product, 708; $708 + 1 = 709$; answer, 709. This shows us why $709 \div 4 =$ 177 and 1 rem., and proves that the answer found by division is correct.

DIVISION

Think This:	But Write Only This:
177 and 1 rem.	177 and 1 rem.
4)709	4)709
4	
30	
28	
29	
28	
1	

The quotient is 177 and 1 rem. because 7 hundreds $\div$ 4 = 1 hundred with 3 hundreds remaining to be changed into tens to be added to the other tens in the dividend; 30 tens $\div$ 4 = 7 tens with 2 tens remaining to be changed into units to be added to the other units in the dividend; 29 units $\div$ 4 = 7 units with 1 unit remaining undivided; answer, 177 and 1 rem. The proof is $177 \times 4 + 1 = 709$ as shown above.

19. $569 \div 2 = ?$
20. $579 \div 3 = ?$
21. $568 \div 3 = ?$
22. $825 \div 3 = ?$
23. $746 \div 4 = ?$
24. $993 \div 5 = ?$
25. $890 \div 5 = ?$
26. $705 \div 4 = ?$
27. $475 \div 3 = ?$
28. $869 \div 3 = ?$

EXAMPLE: $916 \div 3 = ?$

MULTIPLICATION

$$\begin{array}{r} 305 \\ \times 3 \\ \hline 915 \\ +1 \\ \hline 916 \end{array}$$

The answer is 916 because the product of $305 \times 3 = 915$, and we must add 1 to 915 to make 916. 5 units $\times$ 3 = 15 units; write 5 in units' place and carry 1 ten to tens' place; 0 tens $\times$ 3 = 0 tens; 0 tens + 1 ten carried from units' place = 1 ten; write 1 in tens' place; 3 hundreds $\times$ 3 = 9 hundreds; write 9 in hundreds' place; product, 915; $915 + 1 = 916$; answer, 916. This shows us why $916 \div 3 =$ 305 and 1 rem., and proves that the answer found by division is correct.

DIVISION

Think This:	**But Write Only This:**
305 and 1 rem.	305 and 1 rem.
3)916	3)916
9	
1	
0	
16	
15	
1	

The quotient is 305 and 1 rem. because 9 hundreds $\div$ 3 = 3 hundreds; 1 ten $\div$ 3 = 0 tens with 1 ten remaining to be changed into units to be added to the other units in the dividend; 16 units $\div$ 3 = 5 units with 1 unit remaining undivided; answer, 305 and 1 rem. The proof is $305 \times 3 + 1 =$ 916 as shown above.

29. $734 \div 2 = ?$	**35.** $925 \div 3 = ?$
30. $979 \div 2 = ?$	**36.** $988 \div 9 = ?$
31. $825 \div 4 = ?$	**37.** $856 \div 8 = ?$
32. $817 \div 2 = ?$	**38.** $820 \div 4 = ?$
33. $922 \div 3 = ?$	**39.** $819 \div 2 = ?$
34. $837 \div 4 = ?$	**40.** $832 \div 4 = ?$

Exercise 100—Oral and Written.

1. There were 550 buttons in a box; if these buttons were put on cards, 6 buttons to the card, how many cards were filled? How many buttons remained?
2. Make up a good multiplication problem for 86×9. Read your problem to the class. What is your product?
3. Now make a good division problem out of your multiplication problem. Read your problem to the class. Give the quotient.
4. Make up a good division problem showing a quotient of 42 and 3 rem. Read your problem to the class. Prove to the class that your problem is correctly figured.
5. Make up a good division problem using a divisor of 8 and a quotient of 31 and 7 rem. Read your problem to the class. What is your dividend? Prove to the class that your problem is correctly figured.
6. Make up a good division problem using a dividend of 620 and a divisor of 5. What is your quotient? Prove to the class that your quotient is correct.
7. At 3¢ each, what will 278 peaches cost?

8. Make a good division problem using 834 as the dividend and 3 as the divisor. Read your problem to the class. What is your quotient? Prove to the class that your quotient is correct.
9. A man was putting postcards up in packages of 8 cards to the package; when he finished he had 70 packages and 5 cards more; how many cards were there in all?

10. Now make a good division problem out of Question 9. Read your problem to the class. What is your quotient? Prove to the class that your problem is correctly figured.
11. A tie-maker hired Fred for a day to pack ties in boxes and told him to put exactly 6 ties in each box; Fred filled 90 boxes and had 3 ties left; how many ties were there in all?
12. Now make a good division problem out of Question 11. Read your problem to the class. What is your quotient? Prove it to the class.

LESSON 56

Dollars and Cents

EXAMPLE: $7.70 ÷ 5 = ?

MULTIPLICATION

$1.54
5
$7.70

The product is $7.70 because 4 cents × 5 = 20 cents; write 0 in cents' place and carry 2 dimes to dimes' place; 5 dimes × 5 = 25 dimes; 25 dimes + 2 dimes carried from cents' place = 27 dimes; write 7 in dimes' place and carry 2 dollars to dollars' place; 1 dollar × 5 = 5 dollars; 5 dollars + 2 dollars from dimes' place = 7 dollars; answer, $7.70.

This shows us why $7.70 ÷ 5 = $1.54, and proves that the answer found by division is correct.

DIVISION

Think This:	But Write Only This:
$1.54	$1.54
5)$7.70	5)$7.70
5	
27	
25	
20	
20	

The quotient is $1.54 because 7 dollars ÷ 5 = 1 dollar with 2 dollars remaining to be changed into dimes to be added to the other dimes in the dividend; 27 dimes ÷ 5 = 5 dimes with 2 dimes remaining to be changed into cents to be added to the other cents in the dividend; 20 cents ÷ 5 = 4 cents; answer, $1.54.

The proof is $1.54 × 5 = $7.70 as shown above.

When the dividend contains cents or cents and dollars, the quotient will contain cents or cents and

dollars; therefore, the period which is used in the dividend to separate cents from dollars must also be used in the quotient.

Exercise 101—Oral and Written.

A. Tell just how you would work these examples. Do not solve them at this time.

1. If Ted went to work for $7.50 per week, how much did he receive for working each day? How much for working 4 days?
2. If alcohol which is used by engravers costs $6.64 per gallon, what is the cost of 1 quart? What is the cost of 3 quarts?
3. If 9 pounds of lard cost $2.52, what is the cost of 1 pound? What is the cost of 4 pounds?
4. If 5 boys received $8.75 for working in a field, how much did each boy receive? How much did 3 of them receive?
5. If 7 dozen pencils cost $3.36, what is the cost of 1 dozen? What is the cost of 3 dozen? What is the cost of 5 dozen?
6. If the express charges on a 5-pound package shipped from New York to Chicago are $1.85, what is the rate per pound?
7. If a strip of carpet 8 yards long costs $18.80, what is the cost of 1 yard? What is the cost of 5 yards?
8. If a piece of pipe 2 yards long costs $2.10, what is the cost of 1 foot? What is the cost of 4 feet?

9. If the 9 uniforms for a boys' baseball team cost $33.75, how much did each boy's uniform cost? How much did 3 uniforms cost?
10. If 8 pairs of shoes cost $26.00, what is the cost of 1 pair? What is the cost of 4 pairs? What is the cost of 7 pairs?

B. Now work all of these examples.

Exercise 102—Oral Review.

1. What number does the Roman Numeral I stand for? What does V stand for? What does X stand for?
2. Read: II; IV; XII; VII; III; IX; VIII; V; VI; XI.
3. Say the table used for measuring time. Say the days of the week.
4. Say the multiplication table of 5's.
5. Say the division table of 6's.
6. Say the multiplication table of 7's.
7. Say the division table of 8's.
8. Say the multiplication table of 9's.
9. Say the table of Liquid Measure.
10. Say the table of Dry Measure.
11. Say the table of Linear Measure.
12. Say the table of Avoirdupois Weight.

Exercise 103—Written Review.

1. What is the cost of 273# sugar @ 6¢?
2. What is one-fourth of 736? One-eighth of 648? One-ninth of 810?

3. If 884 pairs of gloves were packed into 4 cases, how many pairs would there be in each case?
4. $126 \div 7 = ?$
5. $115 \times 5 = ?$
6. $232 + 4 = ?$
7. $144 - 6 = ?$
8. $\begin{array}{r} ? \\ \hline 6)132 \end{array}$
9. $\frac{1}{8}$ of $112 = ?$
10. What is the total cost of two machines, one costing $468.00, and the other costing $327.00?
11. There is an oak tree 122 yd. from Ralph's house; how many feet is that?
12. When Marshall was flying his kite, he had let out 135 feet of string; how many yards had he let out?
13. How many quarts of milk were there at the milk depot when there were 175 gallons?
14. How many gallons of water were there in our cistern when there were 480 quarts?
15. How many pint bottles can be filled from a barrel containing 76 quarts of cider?
16. When 172 pints of oil are placed in a barrel, how many quarts does the barrel contain?
17. Frank dug 16 pk. of potatoes one day; how many quarts did he dig? How many bushels?
18. Harry's father was away from home 45 weeks; how many days was he away?
19. Elsie's mother, who went to the mountains, was away from home 91 days; how many weeks was she away from home?

20. When John got his new bicycle, he rode 13 miles on Monday, 18 miles on Tuesday, 23 miles on Wednesday, 20 miles on Thursday, 8 miles on Friday, and 26 miles on Saturday; how far did he ride on these six days?

21. The second week John had his bicycle, he rode 75 miles in 5 days; how many miles did he ride on each of these 5 days, counting the same distance for each day?

22. John figured that every time he rode a quarter of a mile, each of the wheels on his bicycle made 180 complete turns; how many times did each wheel turn while John rode 1 mile?

23. The first time John timed himself, he found it took him 263 seconds to ride a mile on his bicycle; a week later he could ride a mile in 239 seconds; how many seconds faster was the second trial than the first?

24. John's bicycle cost \$35.; his brother gave him a horn worth \$2.75 and his sister gave him a headlight worth \$3.45; how much was the entire outfit worth?

25. John used his bicycle to deliver messages during vacation and earned \$4.20 the first week, \$3.95 the second week, and \$4.75 the third week; how much did he earn in all?

26. John started to save to buy a motor wheel for his bicycle; if he saved 8¢ each day, how much did he save in 113 days?

27. Beginning on Christmas, John saved 9¢ each day for 85 days; how much was that?

ARITHMETIC

PART IV

ELEMENTARY LESSONS

ELEMENTARY LESSONS

PART IV

COUNTING, READING AND WRITING THOUSANDS AND MILLIONS

LESSON 1

The Formation of the Period

From what you have already learned, you know how all the numbers to 999 are formed; you know why units', tens', and hundreds' places are used in the manner in which they are used, and you understand why 10 is the number which follows 9, and why 100 is the number which follows 99.

Also, as 999 is the largest number which can be written in three places, it is not necessary to explain that we must use more than three places for numbers larger than 999.

The three places which you have learned (units' place, tens' place and hundreds' place), together form what is called a "period," and because this period contains simple units, simple tens and simple hundreds, this period is called "units' period." Remember, "units' period" is made up of units' place, tens' place and hundreds' place.

Just as we formed units' period out of the first three places, so we form other periods out of each additional three places that we use, and so that these periods may

be separated from each other and to help us in reading the numbers quickly, a comma is used between each two periods in this way:

896,463,721

The name given to the second period is "thousands' period," and the name given to the third period is "millions' period."

Now, just as we had units' place for the first place, tens' place for the second place and hundreds' place for the third place in units' period, so we have a units' place, a tens' place and a hundreds' place in every other period, but instead of calling the first place in every period "units' place," we give it the same name as the period; therefore,

The first place in units' period is units' place.

The first place in thousands' period is thousands' place.

The first place in millions' period is millions' place.

Hundreds of Millions	Tens of Millions	Millions		Hundreds of Thousands	Tens of Thousands	Thousands		Hundreds	Tens	Units
8	9	6	,	4	6	3	,	7	2	1
Millions' Period				Thousands' Period				Units' Period		

Exercise 1—Oral.

1. How many "places" are there in units' period?
2. What are the names of the places in units' period?
3. What is the name of the period which comes next after units' period?
4. How many places are there in this period?

5. What are the names of the places in thousands' period?
6. What is the name of the period which comes next after thousands' period?
7. How many places are there in this period?
8. What are the names of the places in millions' period?
9. How are periods separated from each other?

Exercise 2—Oral.

1. What does a figure written in the first place of units' period show? What name is given to this place?
2. What does a figure written in the first place of thousands' period show? What name is given to this place?
3. What does a figure written in the first place of millions' period show? What name is given to this place?
4. What does a figure written in the second place of units' period show? What name is given to this place?
5. What does a figure written in the second place of thousands' period show? What name is given to this place?
6. What does a figure written in the second place of millions' period show? What name is given to this place?
7. What does a figure written in the third place of units' period show? What name is given to this place?

8. What does a figure written in the third place of thousands' period show? What name is given to this place?
9. What does a figure written in the third place of millions' period show? What name is given to this place?
10. Give the names of the nine places which you know, starting with units' place.

LESSON 2

Orders of Numbers

Starting from the right and reading toward the left, each place is said to be "of the next higher order"; therefore, tens' place is "of the next higher order" after units' place, and so on through all the places.

Each new place of the next higher order is formed and used in the same way as the first three places were formed and used, that is:

We use from 1 to 9 units before using tens.

We use from 1 to 9 tens with all numbers of a lower order before using hundreds.

We use from 1 to 9 hundreds with all numbers of every lower order before using thousands.

We use from 1 to 9 thousands with all numbers of every lower order before using tens of thousands.

We use from 1 to 9 tens of thousands with all numbers of every lower order before using hundreds of thousands.

We use from 1 to 9 hundreds of thousands with all numbers of every lower order before using millions.

We use from 1 to 9 millions with all numbers of every lower order before using tens of millions.

We use from 1 to 9 tens of millions with all numbers of every lower order before using hundreds of millions.

If you add 1 unit to the largest number which can be written in any number of places, it is very easy for you to understand the formation of each new place of the next higher order; thus:

9	99	999	9,999	99,999	999,999
1	1	1	1	1	1
10	100	1,000	10,000	100,000	1,000,000

Exercise 3—Oral.

1. What place is "of the next higher order" after: Units' place? Tens' place? Hundreds' place? Thousands' place? Tens of thousands' place? Hundreds of thousands' place? Millions' place? Tens of millions' place?
2. What is the largest number which can be written in: One place? Two places? Three places? Four places? Five places? Six places? Seven places? Eight places? Nine places?
3. Count by 1's to 10.
4. Count by 10's to 100.
5. Count by 100's to 1,000.
6. Count by 1,000's to 10,000.
7. Count by 10,000's to 100,000.
8. Count by 100,000's to 1,000,000.
9. Count by 1,000,000's to 10,000,000.
10. Count by 10,000,000's to 100,000,000.
11. Count by 100,000,000's to 900,000,000.

Lesson 3

Reading and Writing Thousands and Millions

As you cannot tell the place of the highest order in any number unless all the places of lower orders in that number are used, it is necessary to use a 0 in every such place if no other digit is to be used.

These 0's keep all of the figures in a number in their proper places, and at the same time show for which places there are "none."

In reading numbers, we start with the period of the highest order, and read through the period of the lowest order, reading the figures in each period in the same way as simple hundreds, tens and units are read, saying the name of each period (excepting units' period) after saying the figures in that period; thus:

926 is read "Nine hundred twenty-six."

1,243 is read "One thousand, two hundred forty-three."

37,612 is read "Thirty-seven thousand, six hundred twelve."

714,931 is read "Seven hundred fourteen thousand, nine hundred thirty-one."

1,600,947 is read "One million, six hundred thousand, nine hundred forty-seven."

28,843,175 is read "Twenty-eight million, eight hundred forty-three thousand, one hundred seventy-five."

946,012,119 is read "Nine hundred forty-six million, twelve thousand, one hundred nineteen."

Exercise 4—Oral.

1. Point off into periods, and read:

468;	408;
1395;	408408000;
4876;	408408408;
12843;	10000000;
36612;	20000020;
183716;	203001100;
814612;	101010101;
1346874;	10101010;
8411512;	4040404;
13673846;	4004040;
323419743;	900009900;
846913419;	8730003.

Exercise 5—Written.

Write in figures:

1. Three thousand, four hundred nineteen.
2. Forty-seven thousand, six hundred fifty-five.
3. Two hundred thirty-nine thousand, seven hundred eighty.
4. Eight hundred eighty thousand, two hundred twenty-eight.
5. Seven million, nine hundred thirty-four thousand, two hundred eighty-one.
6. Twenty-eight million, four thousand, two hundred six.
7. Seven hundred thirty-one million, ten thousand, one hundred forty.
8. Two hundred million, three thousand, one.
9. Five hundred million, seven.

10. Eighty-eight million, one hundred thousand.
11. Two hundred million.
12. Ten million, ten thousand, ten.
13. Write five numbers each containing more than five figures.
14. Write the words for the five numbers you have just written.
15. Write the words for the following:

125	$300.35
125,000	$479.28
125,000,000	$110,650.18
46,690,645	$603,509.75
867,312,500	$309,000.50
87,488,604	$2,857,016.88
104,004,400	$64,700,238.25
31,000,003	$303,003,030.30
410,600,010	$900,000,000.00

16. Write the figures for the following when your teacher reads them to you:

425,000	$125.00
7,312	$300.00
5,000,001	$450.75
87,628,443	$5,000.00
135,579,842	$75,550.44
300,003,030	$469,823.09
75,600,000	$9,990.25
834,288,101	$3,777,007.70
66,090,009	$45,800,000.80
357,003,357	$745,612,400.47
4,000,000	$11,000.00
990,090	$3,225,999.19

ADDITION

Lesson 4

Thousands and Millions

EXAMPLE:

4,638,743 (Addend)
+9,876,214 (Addend)
=14,514,957 (Sum)

The addition of numbers of several periods is not more difficult than the addition of numbers of only one period, though, of course, it takes a little longer as there are more columns to be added, and care must be taken that numbers of the same order are placed one under the other.

Beginning with the units, add one column at a time, and no matter how many columns there are, the carrying figure from each column is added to the figures in the column of the next higher order, just as we added the carrying figure from units' column to the tens, and the carrying figure from tens' column to the hundreds.

After finishing an example in addition, always prove that you have the correct sum by re-adding the example upward instead of downward.

In all addition work, you must be very careful to keep from saying a lot of unnecessary words. Do not mention the addends at any time; just mention the sums as you go along.

Exercise 6—Written.

Copy, add, and prove:

1.	2.	3.	4.	5.
4,638	13,463	849,328	1,873,963	13,638,706
3,873	42,876	636,874	2,846,381	128,741
4,687	79,873	938,473	3,863,987	9
2,892	36,928	421,281	2,846,398	107,388
8,463	74,387	937,263	3,647,281	1,248,721
9,748	93,846	847,398	3,947,288	463,872,910

(Can you add the first 3 in 8 minutes? Try!)

6.
$1,001,312.42
213,871.38
103,400,002.25
817,612.75
13,000,120.99
11,000.10

Write in figures, point off, arrange in columns, add, and prove:

7. Four hundred twelve thousand, eight hundred seventy-six.
   Three million, eight hundred twelve thousand, eight hundred forty-six.
   One million, nine hundred eighty-four thousand, seven hundred two.
   Thirteen thousand, twelve.
   Forty-six thousand, eight hundred seventy-two.
   One million, one thousand, one.

8. Three million, six hundred eighty-seven thousand, four hundred twelve.

One hundred twelve million, eight hundred forty-six thousand.

Eighteen million, seven hundred thirty-one thousand, twelve.

Three hundred sixty-three thousand, eight hundred seventy-four.

Eighty-four thousand, nine hundred twenty-one.

Three hundred two million, one thousand, one hundred.

9. Eighteen thousand.

Twenty-one million.

One million, one hundred two thousand.

Seven million, three hundred thousand.

Nineteen million, thirty thousand.

One hundred million.

10. Four hundred thirty-six thousand dollars, fifteen cents.

Seven hundred fourteen dollars, thirty-two cents.

Three hundred twelve million, six hundred thirty-eight dollars.

Three hundred ninety-seven dollars, seventy-five cents.

Four hundred sixty-six thousand, three hundred twelve dollars.

Two hundred ninety-eight million, four hundred eighteen dollars.

Eight hundred seventy-three thousand dollars, thirty cents.

SUBTRACTION

LESSON 5

Thousands and Millions

EXAMPLE:

14,514,957 (Minuend)
−9,876,214 (Subtrahend)
=4,638,743 (Difference)
or
(Remainder)

As in addition, care must be taken that numbers of the same order are placed one under the other.

Whenever a figure of any order in the subtrahend is larger than the figure of the same order in the minuend, we change 1 of the next higher order in the minuend into 10 of the lower order, just as we change 1 hundred into 10 tens or 1 ten into 10 units.

To prove the answer of an example in subtraction, add the remainder to the subtrahend to see if the sum equals the minuend; it must, if the work is correct.

Exercise 7—Written and Oral.

Copy, subtract, and prove:

1.	2.	3.
9,846	46,318	387,641
3,218	21,285	214,923

4.	5.	6.
3,874,681	84,631,221	$2,873,463.50
1,345,183	13,046,219	1,119,031.50

(Practice till you can do the first 6 examples in 5 or 6 minutes.)

Copy, point off, arrange in columns, subtract, and prove:

7. 618412 − 13841.

8. $381412111. − $12618746.

9. Four hundred sixteen million minus nineteen million, eight hundred seventy-one thousand, three hundred twelve.

10. Three hundred million minus nineteen.

11. Read all the minuends.

12. Read all the subtrahends.

13. In 1918 there were 1,730,000 more horses in the United States than in 1910; if there were 21,563,000 in 1918, how many were there in 1910?

14. In 1917 there were 155,583,000 more bushels of potatoes raised in the United States than in 1916; if there were 442,536,000 bu. raised in 1917, how many were raised in 1916?

15. In 1910 there were 2,581,600 more persons living in New York City than in Chicago; if the population of Chicago was 2,185,283, what was the population of New York City?

16. In 1910 the population of Boston, Mass., was 670,585 while that of Philadelphia, Pa., was 1,549,008; how many more persons were there in Philadelphia than in Boston?

MULTIPLICATION

Lesson 6

Thousands and Millions

EXAMPLE:

1384403 (Multiplicand)
$\times 6$ (Multiplier)
=8,306,418 (Product)

Here, again, the carrying figure from each product must be added to the product of the next higher order, just as the carrying figure from the product of the units is added to the product of the tens, and the carrying figure from the product of the tens is added to the product of the hundreds.

In multiplying, do not point off the periods in the multiplicand or multiplier, but point off the periods in the product after completing the example.

Prove the answer of each example in multiplication by dividing the product by the multiplier to see if the quotient of these is equal to the multiplicand; it should be if your work is correct.

Exercise 8—Written.

Copy, multiply, point off the product, and prove:

1.	2.	3.
3941	48391	198416
$\times 8$	$\times 7$	$\times 5$

4.	5.	6.
1387416	8326116	$1586238.
6	9	4

Copy, multiply, and prove:

7. 874638 × 5.
8. 4163128 × 6.
9. Six hundred thirty thousand, one hundred one × seven.
10. Seven hundred forty thousand, twenty dollars × eight.
11. Mr. Rich gave $3,916.25 to each of his 6 nephews and nieces; how much did he give away? (You can prevent many mistakes by estimating the approximate answer mentally after completing an example. You know at a glance that if he had given away 6 times $4,000., the answer would have been $24,000., but as he gave away a little less than 6 times $4,000., the answer should be a little less than $24,000.; it really is $23,497.50. Estimate your answers in this way whenever you can possibly do so.)
12. If a paper folding machine folds 4,975 sheets of paper each hour, how many sheets will it fold in 8 hours? (Estimate as before.)
13. Since there are 1,760 yards in a mile, how many feet are there in a mile?
14. What is the cost of 4,900 lead pencils @ 2¢ each? Give your answer in cents. Answer in dollars.
15. How many nails are there in 9 kegs, if there are 17,360 nails in each keg?

DIVISION

LESSON 7

Thousands and Millions

EXAMPLE:

= 1,384,403 (Quotient)
(Divisor) ÷6)8306418 (Dividend)

When the divisor has been taken out of a figure of any order as many times as possible, each 1 of the remainder must be changed into 10 of the next lower order and added to the figure of that order in the dividend before dividing that order, just as we change the remainder of hundreds into tens and the remainder of tens into units.

In dividing, do not point off the periods in the dividend or divisor, but point off the periods in the quotient after completing the example.

Prove the answer of each example in division by multiplying the quotient by the divisor to see if the product of these, plus the remainder if there is one, is equal to the dividend.

Exercise 9—Written.

Copy, divide, point off the quotient, and prove:

1.	2.	3.
4)41624	8)$8164.24	8)987264

4.	5.	6.
$6\overline{)61358}$	$5\overline{)\$5156.55}$	$9\overline{)996543}$
7.	**8.**	**9.**
$3\overline{)614684}$	$7\overline{)\$7757.26}$	$9\overline{)909828}$
10.	**11.**	**12.**
$6\overline{)616966}$	$5\overline{)\$951985.}$	$4\overline{)805624}$
13.	**14.**	**15.**
$7\overline{)816472}$	$8\overline{)\$9164.72}$	$3\overline{)9164832}$
16.	**17.**	**18.**
$9\overline{)9635}$	$6\overline{)86876}$	$5\overline{)968721}$
19.	**20.**	**21.**
$7\overline{)7387468}$	$8\overline{)86878431}$	$4\overline{)\$41464884.}$

22. 866312 ÷ 6.

23. 834645 ÷ 7.

24. Eight hundred thousand, four hundred eighty-seven dollars, thirty-six cents ÷ eight.

25. Nine hundred forty-eight million, seven hundred thirty-one thousand, nine hundred eighty-eight ÷ five.

26. It has been estimated that 41,664 tons of coal are saved each week by moving the clock forward 1 hour during the summer for daylight saving; how many tons is that for 1 day?

27. In a certain city there are 6,120 pupils enrolled in the public schools; if $\frac{1}{8}$ of the pupils are in the high school and the remainder are in the grammar schools, how many pupils are there in the grammar schools?

MULTIPLICATION

LESSON 8

When the Multiplier is 10

You know from what you have learned that any figure written in tens' place means ten times as much as the same figure written in units' place because 1 ten is as much as 10 units or ten times as much as 1 unit.

You also know that 10 of any order means as much as 1 of the next higher order, as you have used this principle in carrying from one column to the column of the next higher order in all of your addition work.

Knowing this, it is very easy for you to understand that to multiply any number by 10 all that we do is to move every figure in the number to the place of the next higher order, that being one place to the left, and as units' place is left vacant on account of having moved the units to tens' place, we write a 0 in units' place to show that there are no units; therefore, if we write a cipher to the right of any number, we have multiplied that number by 10, thus:

$$1 \times 10 = 10$$
$$10 \times 10 = 100$$
$$100 \times 10 = 1{,}000$$
$$1{,}000 \times 10 = 10{,}000$$
$$10{,}000 \times 10 = 100{,}000$$
$$100{,}000 \times 10 = 1{,}000{,}000$$
$$1{,}000{,}000 \times 10 = 10{,}000{,}000$$
$$10{,}000{,}000 \times 10 = 100{,}000{,}000$$

Exercise 10—Oral.

1. How many times greater is any figure when it is written in tens' place than when it is written in units' place?
2. How many times greater is any figure when it is written in any place, than when it is written in the place of the next lower order?
3. When units are multiplied by 10, what is the product?
4. When tens are multiplied by 10, what is the product?
5. When hundreds are multiplied by 10, what is the product?
6. When hundreds of thousands are multiplied by 10, what is the product?
7. When millions are multiplied by 10, what is the product?
8. When tens of millions are multiplied by 10, what is the product?
9. What figure is written in units' place when a number is multiplied by 10?
10. What is the easiest way of multiplying any number by 10?

Exercise 11—Oral.

Multiply each of these numbers by 10 and give the product:

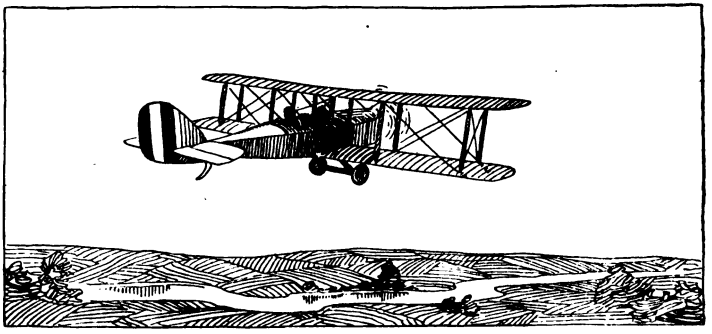
1.	1;	3;	5;	7;	8;
2.	10;	20;	30;	50;	80;
3.	13;	17;	38;	64;	93;
4.	100;	200;	300;	500;	800;

5.	110;	130;	150;	180;	190;
6.	250;	370;	580;	740;	930;
7.	111;	123;	136;	157;	169;
8.	238;	476;	639;	751;	932;
9.	1,000;	3,000;	7,500;	8,000;	9,500;
10.	10,000;	15,000;	100,000;	1,000,000;	10,000,000.

Exercise 12—Oral.

1. In a certain orchard there are 10 rows of apple trees and each row contains 6 trees; how many apple trees are there in all?
2. How many pounds are there in 10 hundredweight?
3. How many hundredweight are there in 10 tons?
4. How many rods are there in 10 miles?
5. If each one of 500 children gave a dime to the Red Cross Fund, how many dimes would there be? How many cents would there be? (Since the product of 500 × 10 is the same as the product of 10 × 500, we use the most convenient order in examples of this kind, but be sure to give your answer the right name.)
6. Ten years is often called a "decade"; how many years are there in 20 decades?
7. If a printing press prints 7,000 magazines in one hour, how many magazines will it print in 10 hours?
8. If a train travels at the rate of 55 miles an hour including all stops, how far will it travel in 10 hours?

9. If an aeroplane travels at the rate of 85 miles an hour including all stops, how far will it travel in 10 hours?



10. Since there are 24 hours in one day, how many hours are there in 10 days?

LESSON 9

Written Multiplication when the Multiplier is 10

EXAMPLE: $46 \times 10 = ?$

$$\begin{array}{r} 46 \\ \underline{10} \\ 460 \end{array}$$

Tens' place in the multiplier is written under units' place in the multiplicand because you are multiplying by 1 ten, not by 1 unit. The 0 is written in the product to raise each figure to the place of the next higher order.

Although any number can be multiplied by 10 mentally, it is very necessary for you to know the proper way of writing such an example, because this is the

foundation for other work which follows; therefore, remember that when you multiply by 10, you really multiply by 1 and raise every figure in the product to the place of the next higher order by writing a 0 to the right of the product.

EXAMPLE: $190 \times 10 = ?$	**EXAMPLE:** $1{,}527 \times 10 = ?$
190	1527
10	10
1,900	15,270

In all of your multiplication work, remember that the product of two numbers is not changed by changing the order of the numbers; thus, $46 \times 10 = 460$, and $10 \times 46 = 460$. As examples must always be done in the shortest way, while working examples you will often have to use a number as if it were the multiplier when really it is the multiplicand. For instance:

$$\$10. \times 46 = \$460.$$

Here \$10. is the multiplicand because it is the number which is to be repeated, and 46 is the multiplier because it is the number which shows how many times \$10. is to be repeated; but in working the example we write 10 under 46 just as if 10 were the multiplier because that shortens the work:

$$\begin{array}{r} 46 \\ 10 \\ \hline 460 \end{array}$$

and we call the answer "dollars" because we multiplied dollars.

Therefore, in these lessons, when "multiplier" is mentioned, it means the number which is being used as the multiplier while the example is being worked, even if it happens to be the multiplicand in the real problem, as $10. was in this one.

Exercise 13—Written.

Copy, find the product, and prove by going over your work a second time:

1.	2.	3.	4.	5.
38	97	439	870	936
10	10	10	10	10

6.	7.	8.	9.	10.
637	9870	12463	426380	36874468
10	10	10	10	10

11. $67 \times 10 = ?$
12. $88 \times 10 = ?$
13. $208 \times 10 = ?$
14. $367 \times 10 = ?$
15. $908 \times 10 = ?$
16. $987 \times 10 = ?$
17. $7{,}690 \times 10 = ?$
18. $94{,}841 \times 10 = ?$
19. $4{,}638{,}730 \times 10 = ?$
20. $8{,}600{,}316 \times 10 = ?$

21. What is the weight of 480 ten-pound sacks of salt?

22. How many eggs are there in 10 crates, if each crate contains 144 eggs? (144 eggs $\times$ 10 = ? eggs.)

23. What is the weight of 10 machines if each machine weighs 2,625 pounds?

24. What is the weight of 3,600 boards if each weighs 10 lb.?

25. What is the cost of 316 chairs @ $10.00 each?

LESSON 10

When the Multiplier is 20, 30, 40, 50, 60, 70, 80 or 90

EXAMPLE: $89 \times 20 = ?$

$$\begin{array}{r} 89 \\ \underline{20} \\ 1{,}780 \end{array}$$

89 is multiplied by 2 tens and the 0 is written in the product to raise each figure to the place of the next higher order.

To multiply any number by 20, 30, 40, 50, 60, 70, 80 or 90, we write the 0 in units' place and use exactly the same principles which we used when multiplying by 10, but we multiply by 2, 3, 4, 5, 6, 7, 8, or 9 tens instead of multiplying by 1 ten. We see, therefore, that multiplication by 30 is the same as multiplication by 10 and then by 3.

EXAMPLE: $340 \times 60 = ?$

$$\begin{array}{r} 340 \\ \underline{60} \\ 20{,}400 \end{array}$$

EXAMPLE: $\$16.09 \times 90 = ?$

$$\begin{array}{r} \$16.09 \\ \underline{90} \\ \$1{,}448.10 \end{array}$$

Exercise 14—Written.

Copy, find the product, and prove:

1.	2.	3.	4.	5.
38	69	370	876	904
20	40	50	80	90

6.	7.	8.	9.	10.
720	3602	19470	687214	8609762
30	60	70	40	50

11. $37 \times 30 = ?$
12. $94 \times 60 = ?$
13. $305 \times 90 = ?$
14. $486 \times 40 = ?$
15. $\$8.17 \times 70 = ?$
16. What is the cost of 20 bicycles @ $48.39?
17. How many yards of calico are there in 6,470 bolts of 50 yards each?
18. What is the value of 88,712 horses @ $80.00?
19. A man gave each of his 30 relatives $9,687.40; what was this man's total gift?
20. The moon is 238,840 miles from the earth; what is 40 times this distance?
21. Multiplication by 90 is the same as multiplication by 10 and by what other number?

Lesson 11

When the Multiplier is 100, 1,000, etc.

EXAMPLE: $312 \times 100 = ?$

312
100
31,200

Here hundreds' place in the multiplier is written under units' place in the multiplicand because you are multiplying by 1 hundred.

EXAMPLE: $6,123 \times 1,000 = ?$

6123
1000
6,123,000

Here thousands' place in the multiplier is written under units' place in the multiplicand because you are multiplying by 1 thousand.

Just as multiplying by 10 raises any figure to the place of the next higher order, so multiplying by 100 raises any figure to the place of the second higher order, and multiplying by 1,000 raises any figure to the place of the third higher order, and so on, the figures in the multiplicand being moved as many places to the left as there are ciphers in the ending of the multiplier; therefore, be careful that in placing your multiplier under the multiplicand, all ciphers in the ending of the multiplier are written to the right of units' place in the multiplicand.

In multiplying, remember to point off the periods in the product after completing the example, but do not point off the periods in either the multiplicand or the multiplier.

Exercise 15—Written.

Copy, find the product, and prove:

1.	**2.**	**3.**	**4.**	**5.**
57	83	360	847	936
100	1000	100	1000	100000

6.	**7.**	**8.**	**9.**	**10.**
3763	43712	869384	73620	896394
100	1000	1000	1000	100

11. 64 × 100 = ?	**16.** $87.41 × 10,000 = ?
12. 87 × 1,000 = ?	**17.** $390.08 × 1,000 = ?
13. 408 × 100 = ?	**18.** 388,411 × 1,000 = ?
14. 785 × 1,000 = ?	**19.** 2,946,837 × 100 = ?
15. 977 × 10,000 = ?	**20.** 6,873,600 × 100 = ?

LESSON 12

When the Multiplier Ends with Two or More Ciphers (As 200, 6,000, etc.)

EXAMPLE: $84 \times 300 = ?$

$$\begin{array}{r} 84 \\ 300 \\ \hline 25{,}200 \end{array}$$

Here 84 is multiplied by 3 hundreds and the two ciphers are written in the product to raise each figure to the place of the second higher order.

To multiply by any number of hundreds, thousands, etc., we follow the same principles which we used when multiplying by 100, 1,000, etc., but we multiply by 2, 3, 4, 5, 6, 7, 8 or 9 hundreds, thousands, etc., as the case may be.

EXAMPLE: $863 \times 4{,}000 = ?$

$$\begin{array}{r} 863 \\ 4000 \\ \hline 3{,}452{,}000 \end{array}$$

EXAMPLE: $697 \times 50{,}000 = ?$

$$\begin{array}{r} 697 \\ 50000 \\ \hline 34{,}850{,}000 \end{array}$$

Exercise 16—Written.

Copy, find the product, and prove:

1.	**2.**	**3.**	**4.**	**5.**
49	73	430	687	903
600	8000	400	9000	80000
6.	**7.**	**8.**	**9.**	**10.**
4768	53846	837621	21874	60000
900	3000	500	6000	700

11.	31 × 60,000 = ?	16.	\$30.20 × 5,000 = ?
12.	87 × 400 = ?	17.	43,871 × 800 = ?
13.	\$2.84 × 900 = ?	18.	291,862 × 300 = ?
14.	398 × 3,000 = ?	19.	\$483.11 × 7,000 = ?
15.	47 × 60,000 = ?	20.	52,000 × 8,000 = ?

Lesson 13

Partial Products

EXAMPLE 63 × 13 = ?

63
(tens) 13 (units)
189
630
819

(Note: The 0 in 630 is written only to show you the complete partial product of 63 × 10; you must not write the 0 when you work your examples.)

Now that you understand how to multiply by any number of units, tens, hundreds, etc., it is going to be very easy for you to learn how to multiply by any combination of units, tens, hundreds, etc., if you remember that you must multiply by each figure in the multiplier separately as though it were the only figure, and then find the sum of these "partial products." Therefore, to multiply 63 by 13, we multiply 63 by 3 units and by 1 ten, then we add these two "partial products" to find the product of 63 × 13.

Notice that 189, which is the partial product found by multiplying by 3 units, starts in units' place, and that 63, which is the partial product found by multiplying by 1 ten, starts in tens' place; therefore, always start each partial product in the place occupied by the multiplying figure which produces that product.

Exercise 17—Written.

Copy, find the product, and prove by re-checking:

1.	2.	3.	4.	5.
46	34	57	26	35
14	15	13	17	18

6.	7.	8.	9.	10.
43	54	67	79	88
23	26	34	42	29

11. $86 \times 63 = ?$ **13.** $97 \times 88 = ?$

12. $75 \times 42 = ?$ **14.** $46 \times 39 = ?$

15. $63 \times 62 = ?$

Exercise 18—Written.

Copy, find the product, and prove by re-checking:

1.	2.	3.	4.	5.
235	346	432	561	$8.76
36	44	58	75	92

6.	7.	8.	9.	10.
5023	$72.29	8641	20123	36442
35	43	67	53	62

11. $\$7.63 \times 48 = ?$

12. $1{,}076 \times 56 = ?$

13. $13{,}247 \times 34 = ?$

14. $7{,}321 \times 64 = ?$

15. $32{,}412 \times 97 = ?$

(Practice until you can do 6 of these examples in 6 minutes)

Exercise 19—Oral and Written.

A. Tell how you would work these examples:

1. A large city school has 16 class-rooms, and each class-room contains 48 desks; how many desks are there in this school? (NOTE.—If there are 48 desks in 1 class-room, there must be 16 times 48 desks in 16 class-rooms.)
2. There are 144 eggs in 1 gross; how many eggs are there in 72 gross?
3. How many minutes are there in 1 day?
4. How many seconds are there in 45 minutes?
5. If a stenographer can write shorthand at the rate of 95 words a minute, how many words can she write in 26 minutes?

6. If a typist can write 45 words in a minute on a typewriter, how many words can she write in 1 hour and 24 minutes?

7. If a building lot in a large city is worth $625., how much are 36 lots worth?
8. If a builder spends $4,875. to build 1 house, how much would he have to spend to build 45 such houses?
9. The distance between New York and Chicago is 912 miles by railroad; how many miles will a salesman travel if he has to make the round trip 12 times in a year?
10. The Panama Canal is 50 miles long; how many miles will a boat travel in going through the canal 28 times?

B. Now work all of the examples.

Lesson 14

Three or More Partial Products

EXAMPLE: 4,324 × 216 = ?	**EXAMPLE:** 975 × 326 = ?
4324	975
216	326
25944	5850
4324	1950
8648	2925
933,984	317,850

When there are three figures in the multiplier, there will be three partial products; when there are four figures, there will be four partial products, and so on without limit, each partial product starting in the place occupied by the multiplying figure which produces that product.

For the multiplier, always select that number which contains the fewest places, and when the two numbers contain the same number of places, then select the smaller number.

Exercise 20—Written.

Copy, find the product, and prove by re-checking:

1.	2.	3.	4.	5.
487	3633	56301	60408	86431
236	586	312	972	761

6.	7.	8.	9.	10.
56312	$864.23	5608	$18.71	949
932	619	413	398	339

11. What is the value of 863 sheep @ $7.14? ($7.14 × 863 = ?)
12. How many pages are there in 1,872 books if each book contains 516 pages?
13. If the value of 1 cow is $56.38, what is the value of 948 cows?
14. How much more is 635 × 63,872 than 436 × 74,845?
15. What is the sum of 368 × 6,213 and 519 × 7,132?

Exercise 21—Written.

Copy, find the product, and prove by re-checking:

1.	2.	3.	4.	5.
14602	88463	$563.19	$68729.	$8632.
636	397	872	876	112

6.	7.	8.	9.	10.
$20704.	431207	6318	$146.32	68432
24	36	746	321	1629

Lesson 15

Multiplication of Numbers Containing Ciphers

EXAMPLE: 4,638 × 230 = ?

4638
230
139140
9276
1,066,740

EXAMPLE: 3,624 × 219,000 = ?

3624
219000
32616000
3624
7248
793,656,000

When a number ends with one or more ciphers, it should always be written beneath the other number, excepting when it contains more places to the left of the ciphers than the other number contains.

In placing the numbers, the first figure to the left of the ciphers must come under the units' figure of the upper number, and these ciphers are written in the first partial product for the same reasons and in the same manner as when we multiplied by 500, 2,000, etc., so that each partial product may have its correct value.

EXAMPLE: 5,932 × 204 = ?

5932
204
23728
11864x (No tens' product)
1,210,128

EXAMPLE: 7,831 × 3,006 = ?

7831
3006
46986
23493xx (No tens' and no
23,539,986 hundreds' products)

When both numbers occupy the same number of places and neither number ends with ciphers, but one of the numbers contains more ciphers than the other number, the number containing the most ciphers should be placed beneath, as this produces fewer partial products.

There will be no partial products for the places which the ciphers occupy so leave a blank space for each cipher, but the other partial products must be placed in their proper places, so that each partial product may have its correct value.

EXAMPLE: 7,314 × 100,700 = ?	**EXAMPLE**: 15,720 × 20,200 = ?
7314	15720
100700	20200
5119800	3144000
7314xx	31440x
736,519,800	317,544,000

When a number ends with ciphers and also contains other ciphers, both of the principles just explained are used.

Exercise 22—Written.

Copy, find the product, and prove by re-checking:

1.	**2.**	**3.**	**4.**	**5.**
3423	2006	6372	4319	2714
460	3220	13600	134000	43900
6.	**7.**	**8.**	**9.**	**10.**
4312	6847	9312	3703	8002
206	309	5008	2109	4007

11.	12.	13.	14.	15.
3246	614	7364	6020	3122
40700	304000	101700	40100	90100

16. 8,314 × 4,006 = ?
17. 6,639 × 208 = ?
18. 4,009 × 7,316 = ?
19. 13,900 × 4,463 = ?
20. 212,000 × 619 = ?
21. 4,716 × 340 = ?
22. 305,000 × 219 = ?
23. 3,040 × 80,700 = ?
24. 20,900 × 4,813 = ?
25. 1,300 × 4,200 = ?

Exercise 23—Oral.

State which number should be placed below in working each of the following examples, and in your own way explain why:

1. 246 × 4,354;
2. 975 × 364;
3. 469 × 17;
4. 643 × 8,057;
5. $3.19 × 637;
6. 1,849 × 4,608;
7. 340 × 286;
8. 318,000 × 34;
9. 426,000 × 324;
10. 406 × 820;
11. 805 × 532;
12. 4,731 × 9,006;
13. 413 × 10,700;
14. 5,320 × 30,400;
15. 1,007 × 4,090;
16. 3,216 × 4,005;
17. 270 × 314;
18. 3,630 × 20,700;
19. 302 × 614;
20. 241 × 4,418.

Exercise 24—Oral Review.

1. Point off into periods, and read:

1379;	438721846;	30040050;
217468;	7387462;	400201;
46138471;	200060030;	4087020;
146870;	10307;	300007.

2. Multiply each of these numbers by 10 and give the product: 46; 187; 99; 313; 600; 4,000.
3. Say the multiplication table of 8's.
4. Say the division table of 9's.
5. Say the table used in counting merchandise.
6. Say the table of Liquid Measure.
7. Say the table of Dry Measure.
8. Read: IX; XII; V; VIII; IV; VII; III; XI.
9. Say the table used in measuring time.
10. Say the table of Avoirdupois Weight.

Exercise 25—Written Review.

(See how long it takes you to do the first 4 examples.)

1. $46{,}318 + 739{,}872 + 4{,}683{,}129 + 9 + 1{,}700 + 630 = ?$
2. $87{,}463{,}912 - 29{,}872{,}846 = ?$
3. $38{,}712 \times 3{,}124 = ?$
4. $365{,}464 \div 9 = ?$
5. What is the cost of 90 sofas @ $16.75?
6. There were 46,713 bricks in one pile, 32,946 in another pile and 76,377 in still another pile; how many bricks were there in all?
7. A clock which ticks 3,600 times every hour will tick how many times in 720 hours?
8. There was oil enough in a large tank to fill a smaller tank exactly 6 times; if there were 3,900 gallons in the large tank, how many gallons did the smaller tank hold?
9. How many pages are there in 612 books, if each book contains 196 pages?
10. If 79 yd. of calico were cut from a bolt which contained 144 yd., how many yards remained?

DIVISION

LESSON 16

When the Divisor is 10

Just as moving each figure in a number toward the left to the place of the next higher order multiplies that number by 10, so moving each figure in a number toward the right to the place of the next lower order divides it by 10 because 1 of any order is equal to 10 of the next lower order.

In doing this, the tens naturally become units and the units become the remainder; therefore, if units' place was occupied by a 0, dividing by 10 cancels the 0 and there is no remainder, but if units' place was occupied by any other figure, that figure becomes the remainder.

Dividing by 10 in this manner, we find that:

$$100{,}000{,}000 \div 10 = 10{,}000{,}000$$
$$10{,}000{,}000 \div 10 = 1{,}000{,}000$$
$$1{,}000{,}000 \div 10 = 100{,}000$$
$$100{,}000 \div 10 = 10{,}000$$
$$10{,}000 \div 10 = 1{,}000$$
$$1{,}000 \div 10 = 100$$
$$100 \div 10 = 10$$
$$10 \div 10 = 1$$

Exercise 26—Oral.

1. What is the effect of moving a figure from tens' place to units' place?

2. What is the effect of moving any figure from any place to the place of the next lower order?
3. When tens are divided by 10, what is the product?
4. When hundreds are divided by 10, what is the product?
5. When thousands are divided by 10, what is the product?
6. When hundreds of thousands are divided by 10, what is the product?
7. When millions are divided by 10, what is the product?
8. When tens of millions are divided by 10, what is the product?
9. When tens are moved to units' place in dividing by 10, what becomes of the figure which originally occupied units' place?
10. What is the easiest way of dividing any number by 10?

Exercise 27—Oral.

Divide each of these numbers by 10, and give the quotient, also the remainder, if any:

1.	10;	30;	50;	70;	90.
2.	46;	57;	97;	83;	69.
3.	140;	360;	570;	780;	940.
4.	372;	489;	612;	814;	931.
5.	1,500;	3,749;	5,862;	7,319;	8,647.
6.	86,000;	98,700;	46,320;	57,600;	63,000.
7.	43,872;	56,912;	67,463;	73,919;	86,438.
8.	437,000;	658,700;	3,475,000;		65,500,500.

Now begin at the bottom.

Exercise 28—Oral.

1. If there are 480 passengers on a railroad train of 10 coaches, and each coach contains the same number of passengers, how many passengers are there in each coach?
2. 10 years is a decade; how many decades are there in 570 years?
3. If 10 acres planted with corn produce 390 bushels, how many bushels is that for each acre? How many bushels will 100 acres produce?
4. If 10 acres planted with potatoes produce a crop worth $2,900., what is the value of the crop produced by each acre? What is the value of the crop produced by 100 acres?
5. How many dimes are there in 4,300 cents?
6. The weight of 10 bushels of potatoes is 600 pounds; what is the weight of 1 bushel? What is the weight of 100 bushels? What is the weight of 1,000 bushels?
7. There are 36,000 seconds in 10 hours; how many seconds are there in 1 hour?
8. A rope wound around the earth 10 times at the equator would be about 250,000 miles long; what is the distance around the earth?
9. What is one-tenth of the distance around the earth if the entire distance is 25,000 miles?
10. Fast railroad trains travel about 500 miles in 10 hours; what rate of speed is that per hour?

LESSON 17

When the Divisor Ends with Two or More Ciphers (As 100, 1,000, etc.)

Just as dividing by 10 lowers any figure to the place of the next lower order, so dividing by 100 lowers any figure to the place of the second lower order, and dividing by 1,000 lowers any figure to the place of the third lower order, and so on, as many of the figures from the right-hand end of the dividend becoming the remainder as there are ciphers in the ending of the divisor, and when these figures from the right-hand end of the dividend are all ciphers, there is no remainder.

Examples:

463 ÷ 100 = 4 and 63 rem.;
6,408 ÷ 100 = 64 and 8 rem.;
6,100 ÷ 100 = 61;
73,000 ÷ 1,000 = 73.

Exercise 29—Oral.

Divide each of these numbers and give the quotient, also give the remainder if there is one:

1.	500 ÷ 100;	7,100 ÷ 100;	8,000 ÷ 100.
2.	631 ÷ 100;	1,874 ÷ 100;	3,648 ÷ 100.
3.	902 ÷ 100;	2,608 ÷ 100;	4,709 ÷ 100.
4.	6,000 ÷ 1,000;	8,000 ÷ 1,000;	12,000 ÷ 1,000.
5.	7,100 ÷ 1,000;	8,500 ÷ 1,000;	9,700 ÷ 1,000.
6.	6,410 ÷ 1,000;	7,330 ÷ 1,000;	8,640 ÷ 1,000.
7.	7,310 ÷ 1,000;	8,847 ÷ 1,000;	9,638 ÷ 1,000.
8.	4,008 ÷ 1,000;	6,019 ÷ 1,000;	8,100 ÷ 1,000.
9.	210 ÷ 100;	8,160 ÷ 1,000;	413 ÷ 100.
10.	14,318 ÷ 10,000;		87,639 ÷ 10,000.

LESSON 18

When the Divisor and Dividend Both End with One or More Ciphers

EXAMPLE: 460 ÷ 20 = ?

$$2\emptyset\overline{)46\emptyset}\quad 23$$

Cancelling the ciphers is the same as dividing by 10; this changes the dividend to 46 and the divisor to 2; this shortens your work; 46 ÷ 2 = 23.

EXAMPLE: 4,600 ÷ 20 = ?

$$2\emptyset\overline{)460\emptyset}\quad 230$$

We never cancel more ciphers in the dividend than we have cancelled in the divisor.

EXAMPLE: 4,600 ÷ 200 = ?

$$2\emptyset\emptyset\overline{)46\emptyset\emptyset}\quad 23$$

Here we cancelled two ciphers in the dividend because we cancelled two ciphers in the divisor; in other words, we have divided both numbers by 100.

EXAMPLE: 4,700 ÷ 200 = ?

$$2\emptyset\emptyset\overline{)47\emptyset\emptyset}\quad 23 \text{ and } 100 \text{ rem.}$$

When there is a remainder, the cancelled ciphers from the dividend must be written after the remainder. In this example you have already divided by 100 by cancelling the two ciphers, therefore, the remainder is not 1 unit, but 1 hundred, as it comes from hundreds' place in the dividend.

When there are as many or more ciphers in the ending of the dividend as there are in the ending of the

divisor, you can cancel the ciphers in the ending of the divisor by cancelling the same number of ciphers in the ending of the dividend, then divide in the usual manner. We see, therefore, that division by 20 is the same as division by 10 and then by 2.

Exercise 30—Written.

Copy, divide, and prove by multiplication:

1.	2.	3.	4.	5.
$20\overline{)540}$	$30\overline{)630}$	$40\overline{)850}$	$50\overline{)960}$	$90\overline{)990}$
6.	**7.**	**8.**	**9.**	**10.**
$20\overline{)7600}$	$40\overline{)8400}$	$60\overline{)9600}$	$70\overline{)7700}$	$90\overline{)4500}$

11. $4{,}800 \div 200$;

12. $5{,}600 \div 300$;

13. $8{,}500 \div 500$;

14. $8{,}800 \div 700$;

15. $9{,}600 \div 800$;

16. $48{,}000 \div 300$;

17. $54{,}000 \div 90$;

18. $72{,}000 \div 4{,}000$;

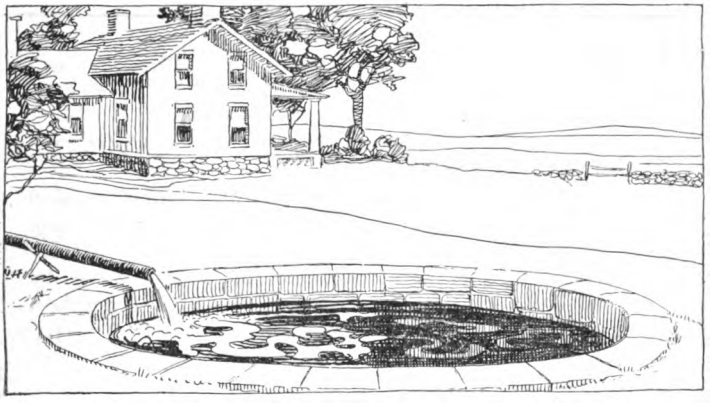
19. $86{,}000 \div 500$;

20. $36{,}000 \div 60$.

21. If 36,000 bricks are divided into 30 heaps, how many bricks will there be in each heap? How many bricks will there be in 10 heaps?

22. If a book contains 180,000 words and there are 200 words on a page, how many pages are there in the book? How many words are there on 10 pages in this book?

23. If 40 gallons of water can be drawn from a certain pipe in 1 minute, how many minutes will it take for the pipe to fill a cistern containing 12,000 gallons? How many hours will it take?



24. How much greater is 36,000 ÷ 600 than 20,000 ÷ 500?

25. What is the sum of 4,900 ÷ 70 and 56,000 ÷ 700?

26. A carload of freight weighed 36,000 pounds and contained 90 cases of merchandise; if the 90 cases were uniform in weight, what did each case weigh? What was the weight of 20 cases?

27. How many tons were there in the carload of freight in Question 26? (1 ton = 2,000 lb.)

28. If an 80-acre field planted in hay will produce a crop weighing about 240,000 pounds, what is the weight of the crop produced by 1 acre? What would be the weight of the crop produced by a 30-acre field?

LESSON 19

When There Are More Ciphers in the Ending of the Divisor than There Are in the Ending of the Dividend

EXAMPLE: 366 ÷ 60 = ?

6 and 6 rem.
6Ø)36Ø

When we divide 366 by 10, we have a remainder of 6 units.

EXAMPLE: 376 ÷ 60 = ?

6 and 16 rem.
6Ø)37Ø

Here, besides the remainder of 6 units which is caused by dividing 376 by 10, we have another remainder of 1 ten caused by dividing 37 tens by 6, giving us a total remainder of 16.

EXAMPLE: 3,660 ÷ 600 = ?

6 and 60 rem.
6ØØ)36ØØ

When we divide 3,660 by 100, we have a remainder of 60.

EXAMPLE: 3,760 ÷ 600 = ?

6 and 160 rem.
6ØØ)37ØØ

Here we have an additional remainder of 1 hundred, caused by dividing 37 hundreds by 6.

When there are more ciphers in the ending of the divisor than there are in the ending of the dividend, for each cipher that we cancel in the divisor we cancel one place in the ending of the dividend, but these cancelled figures then form a remainder.

This remainder, which is found by cancelling figures, must be added to any additional remainder that may be found when we complete the division.

Exercise 31—Written.

Copy, divide, and prove by multiplication:

1.	2.	3.	4.	5.
$20\overline{)547}$	$30\overline{)639}$	$40\overline{)847}$	$50\overline{)953}$	$90\overline{)909}$
6.	**7.**	**8.**	**9.**	**10.**
$20\overline{)555}$	$30\overline{)649}$	$40\overline{)867}$	$50\overline{)983}$	$90\overline{)938}$

11. 4,819 ÷ 200;

12. 5,470 ÷ 300;

13. 8,549 ÷ 500;

14. 8,403 ÷ 700;

15. 9,687 ÷ 800;

16. 4,917 ÷ 200;

17. 5,670 ÷ 300;

18. 8,796 ÷ 500;

19. 8,805 ÷ 500;

20. 9,982 ÷ 800.

21. What number multiplied by 300 equals 3,600?

22. What number multiplied by 400 equals 96,000?

23. What number multiplied by 50 equals 7,500?

24. A certain number multiplied by 800 gives a product of 4,000; what is the number?

25. A certain number multiplied by 70 gives a product of 49,000; what is the number?

26. Division by 60 is the same as division by 10 and then by what other number?

27. How many times is 300 contained in 4,760?

28. If soap is packed 200 bars to the box, 4,930 bars will fill how many boxes and leave what remainder?

LONG DIVISION

LESSON 20

Long and Short Division Compared

In working a division example, as $6\overline{)936}$, you really used three separate steps one after the other, but as you wrote the answer without showing the steps, we called this "short division."

$$\begin{array}{r} 156 \\ 6\overline{)936} \end{array}$$

1st step: 9 hundreds ÷ 6 = 1 hundred with a remainder of 3 hundreds to be changed into tens to be added to the other tens in the dividend.

2d step: 33 tens ÷ 6 = 5 tens with a remainder of 3 tens to be changed into units to be added to the other units in the dividend.

3d step: 36 units ÷ 6 = 6 units with no remainder.

Now, if instead of just thinking the steps you were to write all of them in the simplest possible manner, you would have an example in "long division," and your work would look like this:

1st step:
$$\begin{array}{r} 1 \\ 6\overline{)936} \\ =6 \\ \hline 3 \end{array}$$

9 hundreds ÷ 6 = 1 hundred and 3 over; therefore, write 1 in the quotient in hundreds' place; 6 × 1 = 6; therefore, write 6 under 9 and subtract, showing the remainder of 3 hundreds.

2d step:

$$\begin{array}{r} 15 \\ 6\overline{)936} \\ 6 \\ \hline 33 \\ =30 \\ \hline 3 \end{array}$$

Bring down the 3 tens, making 33 tens; 33 tens ÷ 6 = 5 tens and 3 over; therefore, write 5 in the quotient in tens' place; 6 × 5 = 30; therefore, write 30 under 33 and subtract, showing the remainder of 3 tens.

3d step:

$$\begin{array}{r} 156 \\ 6\overline{)936} \\ 6 \\ \hline 33 \\ 30 \\ \hline 36 \\ =36 \end{array}$$

Bring down the 6 units, making 36 units; 36 units ÷ 6 = 6 units; therefore, write 6 in the quotient in units' place; 6 × 6 = 36; therefore, write 36 under 36 and subtract, showing no remainder.

As we have three separate divisions to make, we have three dividends each of which contains a part of the original dividend; therefore, each of the three dividends 9, 33, and 36, is called a "partial dividend."

Now compare each step in the short division work with the same step in the long division work.

Exercise 32—Written.

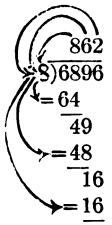
Examples like the following should always be worked by short division just as you have been working them, but to help you learn long division, you are to work these that way.

1.	**2.**	**3.**	**4.**	**5.**
$4\overline{)876}$	$7\overline{)931}$	$6\overline{)696}$	$9\overline{)999}$	$5\overline{)855}$
6.	**7.**	**8.**	**9.**	**10.**
747 ÷ 3;	976 ÷ 8;	732 ÷ 6;	896 ÷ 8;	994 ÷ 7.

LESSON 21

When the Divisor is Greater than the First Figure of the Dividend

EXAMPLE: 6,896 ÷ 8 = ?



6 thousands cannot be divided by 8; therefore, they must be changed into hundreds and added to the other hundreds in the dividend; 68 hundreds ÷ 8 = 8 hundreds with 4 hundreds remaining to be changed into tens; 49 tens ÷ 8 = 6 tens with 1 ten remaining to be changed into units; 16 units ÷ 8 = 2 units.

Whenever the divisor is greater than the first figure of the dividend, you must use the first two figures of the dividend as your first partial dividend just as you did in short division, writing the first figure of the quotient above the second figure of the dividend.

EXAMPLE: 735 ÷ 7 = ?

```
  105
7)735
  7
  ~~3~~
  ø
  35
  35
```

In this example all of the partial dividends are shown, but the figures which are cancelled are really unnecessary.

Whenever the divisor is greater than any partial dividend, we write a 0 in the quotient, bring down the next figure making a new partial dividend, and proceed as before.

The same example is now shown again with the unnecessary figures left out. Though there seem to be only two partial dividends, there are really three, just as before:

EXAMPLE: 735 ÷ 7 = ?

```
  105
7)735
 7
 35
 35
```

7 hundreds ÷ 7 = 1 hundred with no remainder; write 1 in hundreds' place in the quotient.

3 tens ÷ 7 = 0 tens with 3 tens remaining to be changed into units; write 0 in tens' place.

35 units ÷ 7 = 5 units; write 5 in units' place.

Exercise 33—Written.

These examples are to be worked by long division for practice:

1.	2.	3.	4.	5.
6)4872	5)3735	9)5598	7)749	8)856

6.	7.	8.
9,459 ÷ 9;	6,424 ÷ 8;	5,649 ÷ 7;

9.	10.	11.
4,836 ÷ 6;	3,232 ÷ 4;	2,124 ÷ 3;

12.	13.	14.
3,628 ÷ 4;	5,436 ÷ 6;	7,248 ÷ 8;

15.	16.
36,463 ÷ 7;	73,827 ÷ 9.

LESSON 22

When the Dividend Contains Ciphers

EXAMPLE: $504 \div 4 = ?$

```
  126
4)504
  4
  10
   8
   24
   24
```

The cipher becomes part of the second partial dividend.

EXAMPLE: $45{,}009 \div 9 = ?$

```
  5,001
9)45009
  45
   Ø
   Ø
    Ø
    Ø
    9
    9
```

The figures which are cancelled are only shown so that you may understand why the two 0's appear in the quotient. The example is worked again with these figures left out, to show how you are to work similar examples.

EXAMPLE: $45{,}009 \div 9 = ?$

```
  5,001
9)45009
  45
   xx9
    9
```

Do not fail to use every figure in the dividend in your partial dividends.

When the dividend contains ciphers, each cipher must be brought down into the partial dividends just as any other figure would be.

In dividing, remember to point off the periods in the quotient after completing the example.

Exercise 34—Written.

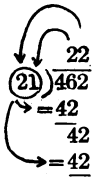
These examples are to be worked by long division for practice:

1.	805 ÷ 7 = ?	**6.**	54,009 ÷ 9 = ?
2.	904 ÷ 8 = ?	**7.**	63,077 ÷ 7 = ?
3.	603 ÷ 9 = ?	**8.**	52,005 ÷ 5 = ?
4.	704 ÷ 8 = ?	**9.**	4,240,800 ÷ 8 = ?
5.	5,406 ÷ 6 = ?	**10.**	3,603,600 ÷ 6 = ?

Lesson 23

Divisors Containing Two Figures

EXAMPLE: 462 ÷ 21 = ?



The first step is to find how many times 21 will go into 46; you know that 2 will go into 4 two times, so you mentally multiply the second figure of the divisor by 2 to see if this will make a larger product than the second figure of the partial dividend, which is 6; knowing that 2 × 1 is only 2 and that this is less than 6, you know that 21 will go into 46 two times; therefore, you write 2 in the quotient and multiply 21 × 2, writing 42 under 46 and subtract as usual; then you bring down your next figure to make a new partial dividend and proceed as before.

You are now going to learn how to use your knowledge of division on examples having divisors of two or more places.

In your work with one-place or single-figure divisors, you have found that your divisor will go into any single-figure partial dividend only if the single figure is as great or greater than the divisor, for when the single-figure partial dividend was not as great as the divisor we had to use two figures as a partial dividend. Now, in the same way, a divisor of two places cannot possibly divide a partial dividend of only one place, and it will divide a partial dividend of two places only when the number in those two places is as great or greater than the divisor, otherwise the partial dividend must have three places before you can divide. Therefore, in an example like 462 ÷ 21, each partial dividend must be of two places containing a number as large or larger than 21, otherwise three places are necessary in the partial dividend.

Exercise 35—Oral and Written.

A. Tell whether you are finding one of the equal parts of a number, or how many times one number is contained in another number.

B. Copy, divide, and prove by multiplication:

1.	2.	3.	4.	5.
$33\overline{)693}$	$23\overline{)483}$	$42\overline{)882}$	$34\overline{)748}$	$24\overline{)552}$

6. 9,641 ÷ 31;

7. 9,768 ÷ 22;

8. 5,203 ÷ 43;

9. 4,114 ÷ 34;

10. 3,384 ÷ 24.

11. How many times can a 32-gallon tank be filled out of a cistern holding 384 gallons?

    $32\text{ gal.})\overline{384\text{ gal.}}$ = number of times.

12. If 528 children are arranged in rows so that there are 22 children in each row, how many rows will there be?
13. If a man travels a distance of 693 miles in daily journeys of 21 miles each, how many days will he travel?
14. Find the difference between 903 ÷ 43 and 408 ÷ 34.
15. Find the sum of 483 ÷ 23 and 992 ÷ 31.

LESSON 24

When a Two-Figure Divisor is Greater than the First Two Figures of the Dividend

EXAMPLE: 189 ÷ 21 = ?

$$\begin{array}{r} 9 \\ 21\overline{)189} \\ \underline{189} \end{array}$$

Here you know that 18 cannot be divided by 21; therefore, the partial dividend is 189; you know that 18 ÷ 2 = 9 so you test 9 × 1 to see if this produces a product greater than the third figure of the dividend, and as you find that this product is not greater than the third figure, you know that 21 will go into 189 nine times.

When the two figures of the divisor are greater than the two figures of the partial dividend, the partial dividend must contain three figures.

Exercise 36—Written.

Copy, divide, and prove:

1. $176 \div 22 = ?$
2. $192 \div 32 = ?$
3. $170 \div 34 = ?$
4. $336 \div 42 = ?$
5. $318 \div 53 = ?$
6. $5{,}551 \div 61 = ?$
7. $5{,}913 \div 73 = ?$
8. $4{,}284 \div 51 = ?$
9. $74{,}796 \div 92 = ?$
10. $29{,}713 \div 43 = ?$

11. In an example in multiplication, the multiplier is 44 and the product is 3,784; what is the multiplicand?
12. In an example in multiplication, the multiplicand is 45 and the product is 360; what is the multiplier?
13. In an example in multiplication, the multiplicand is 93 and the multiplier is 31; what is the product?
14. How many times can a sack holding 62 pounds of flour be filled from a bin holding 3,844 pounds?
15. How many strings of 74 beads each can be made from 5,994 beads?
16. In making a certain box, 32 feet of lumber were used; how many such boxes can be made from 2,176 feet of lumber?
17. If 36 large size leather soles can be cut from a hide of leather, how many hides will be needed to cut 1,512 such soles?
18. A confectioner got 72 pieces out of each pan of caramels he made; how many pans did he need to make 1,728 caramels?
19. How many pans would he have needed if he wanted to make 2,592 caramels?

LONG DIVISION

Lesson 25

Approximating

EXAMPLE: $145 \div 29 = ?$

$$\begin{array}{r} 5 \\ 29\overline{)145} \\ \underline{145} \end{array}$$

$14 \div 2 = 7$, but on testing $7 \times 9 = 63$ you produce a carrying figure of 6 which when added to $14 = 20$, which is much greater than 14; therefore, 29 will not go into 145 seven times, nor even six times; it goes exactly 5 times. Now as 29 is nearly 30, and 145 is nearly 150, test 3 into 15 which equals 5, and 5 is the exact divisor in this example.

Very often the divisor will not go into a partial dividend as many times as appears at first glance, on account of the carrying figure produced by the multiplication. In cases of this kind, much time can be saved by making your test with the next higher number.

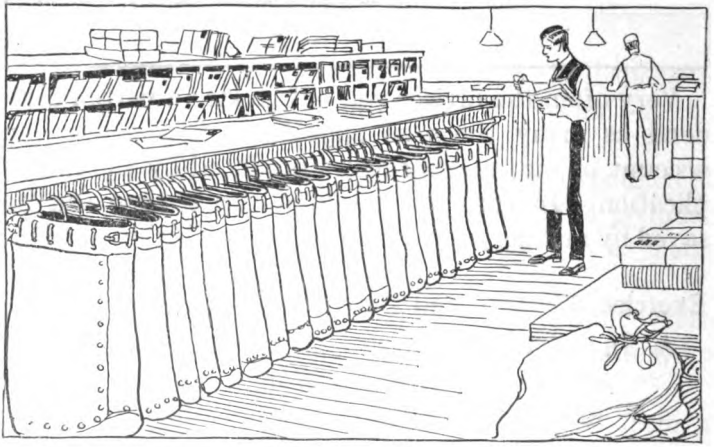
Exercise 37—Oral and Written.

A. In each of the following examples, are you finding one of the equal parts of a number, or how many times one number is contained in another number?

B. Copy, divide, and prove:

1. $1{,}599 \div 39 = ?$
2. $3{,}984 \div 48 = ?$
3. $4{,}779 \div 59 = ?$
4. $9{,}867 \div 69 = ?$
5. $6{,}497 \div 89 = ?$
6. $9{,}317 \div 77 = ?$
7. $14{,}824 \div 68 = ?$
8. $28{,}952 \div 88 = ?$
9. $32{,}214 \div 78 = ?$
10. $25{,}578 \div 49 = ?$

11. A merchant bought 1,392 pairs of shoes from a manufacturer, and when the shipment arrived, he found that each packing case contained 48 pairs; how many packing cases were there?
12. A stationer had 1,296 sheets of paper out of which he wanted to make 36 pads. What part of the 1,296 sheets makes 1 pad? How many sheets did he put in each pad?
13. A factory using 27 tons of coal each day has a supply of 918 tons on hand; how many days can this factory operate on this supply?



14. There were 18,981 letters in 19 mail pouches; if all the pouches contained the same number of letters, each pouch contained what part of 18,981 letters? How many were in each pouch?
15. How would you test for the following divisors: 49? 68? 79? 37?

LONG DIVISION

Lesson 26

Ciphers in the Quotient

EXAMPLE: 5,724 ÷ 53 = ?

```
      108
   53)5724
      53
      42   (Too small)
     =00
      424
      424
```

To show clearly why 0 is the second figure of the quotient, this example is worked with the unnecessary figures shown and cancelled, but you are to work similar examples as follows:

EXAMPLE: 5,724 ÷ 53 = ?

```
      108
   53)5724
      53
      424
      424
```

The unnecessary figures shown and cancelled in the previous example are left out of this example.

Whenever the divisor is larger than any partial dividend, we write a 0 in the quotient, bring down the next figure making a new partial dividend, and proceed as before.

EXAMPLE: 5,106 ÷ 46 = ?

```
      111
   46)5106
      46
      50
      46
       46
       46
```

EXAMPLE: 540,070 ÷ 53 = ?

```
      10,190
   53)540070
      53
      100
       53
       477
       477
```

Whenever the dividend contains ciphers, each cipher must be brought down into the partial dividends just as any other figure would be.

Exercise 38—Oral and Written.

A. In each example, are you finding the size of one part, or the number of parts?

B. Copy, divide, and prove:

1.	6,624 ÷ 32 = ?	**6.**	8,003 ÷ 53 = ?
2.	22,264 ÷ 44 = ?	**7.**	12,012 ÷ 39 = ?
3.	11,433 ÷ 37 = ?	**8.**	208,208 ÷ 52 = ?
4.	424,318 ÷ 53 = ?	**9.**	460,080 ÷ 36 = ?
5.	46,032 ÷ 28 = ?	**10.**	360,000 ÷ 48 = ?

11. In an orchard of 7,982 trees, the trees were planted in rows of 26 trees each; how many rows were there?

12. The weight of a bushel of oats is 32 lb.; how many bushels are there in a shipment weighing 19,488 lb.?

13. If a cow costs $54., how many cows can be bought for $9,504.?

14. If farm land is worth $74. an acre, how many acres can be bought for $9,250.?

15. If 69 acres of farm land cost $5,037., what is the value of 1 acre?

16.	7,228 ÷ 26 = ?	**21.**	822,111 ÷ 19 = ?
17.	7,260 ÷ 33 = ?	**22.**	11,687 ÷ 29 = ?
18.	7,272 ÷ 72 = ?	**23.**	27,742 ÷ 97 = ?
19.	9,158 ÷ 38 = ?	**24.**	81,627 ÷ 39 = ?
20.	6,239 ÷ 17 = ?	**25.**	21,637 ÷ 77 = ?

(Time yourself on the last 4. Do them in 8 minutes.)

LONG DIVISION

Lesson 27

Divisors Containing Three or More Figures

EXAMPLE: 395,514 ÷ 146 = ?

```
      2,709
146)395514
     292
     1035
     1022
      1314
      1314
```

For a divisor of three places, each partial dividend must be of three places containing as large a number as the divisor, otherwise it must contain four places.

EXAMPLE: 1,187,076 ÷ 2,346 = ?

```
       506
2346)1187076
     11730
      14076
      14076
```

For a divisor of four places, each partial dividend must be of four places containing as large a number as the divisor, otherwise the partial dividend must contain five places.

No matter how many places the divisor contains, each partial dividend must be of the same number of places and must contain at least as large a number as the divisor, otherwise the partial dividend must contain one place more than the divisor.

EXAMPLE: 24,678 ÷ 432 = ?

```
        57 and 54 rem.
432)24678
    2160
    3078
    3024
      54 (Remainder)
```

When there is an undivided remainder, this should be written after the quotient.

EXAMPLE: $568.92 ÷ 431 = ?

```
          $1.32
431)$568.92
     431
     1379
     1293
      862
      862
```

When you find part of a dividend containing dollars and cents, the quotient will contain dollars and cents.

EXAMPLE: $625. ÷ $25. = ?

```
      25 = number of times
$25.)$625.
     50
     125
     125
```

When the dividend and divisor are like numbers, the quotient will tell the number of times that one is contained in the other.

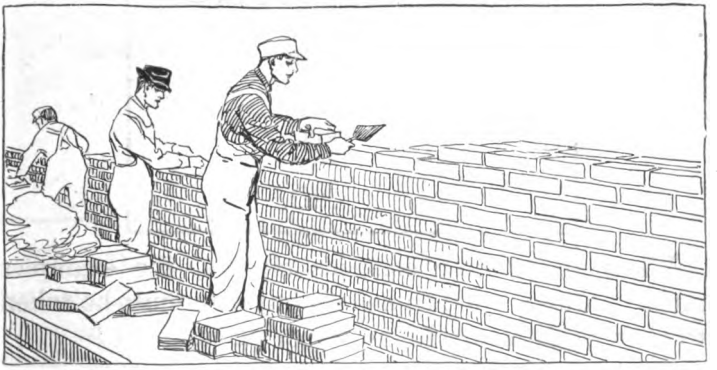
Exercise 39—Oral and Written.

A. In each example, are you finding the size of one part, or the number of parts?

B. Copy, divide, and prove:

1. 1,669,668 ÷ 462 = ?
2. $17,443.89 ÷ 621 = ?
3. 287,284 ÷ 345 = ?
4. 17,565,912 ÷ 312 = ?
5. 114,978 ÷ 487 = ?
6. 888,872 ÷ 636 = ?
7. 600,087 ÷ 334 = ?
8. $4,134.48 ÷ 321 = ?
9. $4,672. ÷ $146. = ?
10. 900,000 ÷ 851 = ?

11. In building a certain wall, 872 bricks were used; how many similar walls could be built from 230,208 bricks?



12. A laborer piling lumber was told to put 148 boards in each pile; he had 7,648 boards to handle;

how many piles of 148 boards each did he make, and how many boards were left over?

13. A man packing gloves was told to put 144 pairs in each box; how many boxes did he fill and how many pairs of gloves were left over, if the entire lot contained 86,420 pairs?

14. If a wheel turns 156 times in a minute, how many minutes will it take the wheel to turn 11,544 times?

15. In paving a street, 576 bricks were used to pave one yard of the street from curb to curb; how many yards had been paved when 246,528 bricks had been used?

LESSON 28

Divisors Containing Ciphers

EXAMPLE: 4,649,280 ÷ 2,004 = ?

$$
\begin{array}{r}
2{,}320 \\
2004\overline{)4649280} \\
4008 \\
\hline
6412 \\
6012 \\
\hline
4008 \\
4008 \\
\hline
\end{array}
$$

When the divisor contains ciphers, the examples must be worked just as before, but care must be taken to keep every figure in its proper place.

In this example there is no remainder from the tens' partial dividend (4,008); therefore, it is not necessary to write another partial dividend for the 0 in units' place.

EXAMPLE: 929,200 ÷ 4,600 = ?

```
      202
46ØØ)929ØØ
      92
       92
       92
```

When the cancelled figures in the dividend are all ciphers and there is no other remainder, then there is no remainder whatever.

EXAMPLE: 75,646 ÷ 3,600 = ?

```
      21 and 46 rem.
36ØØ)756Ø6
      72
       36
       36
```

Here the cancelled figures 46 form the remainder.

EXAMPLE: 98,800 ÷ 4,700 = ?

```
      21 and 100 rem.
47ØØ)988ØØ
      94
       48
       47
        1
```

Here we have a remainder of 1 hundred, as the remainder 1 is from hundreds' place in the dividend.

EXAMPLE: 86,246 ÷ 3,400 = ?

```
      25 and 1,246 rem.
34ØØ)862Ø6
      68
       182
       170
        12
```

Besides having a remainder of 46 caused by cancelling the two ciphers in the divisor, we have an additional remainder of 1 thousand and 2 hundreds, making a total remainder of 1,246.

When the divisor ends with one or more ciphers, we can cancel these ciphers by cancelling a like number of places in the dividend and writing the cancelled figures in the remainder. Any additional remainder must be given its full value by writing it before the remainder caused by cancelling.

Exercise 40—Oral and Written.

A. In each example, are you finding the size of one part, or the number of parts?

B. Copy, divide, and prove:

1. 71,020 ÷ 530 = ?
2. 374,960 ÷ 860 = ?
3. 82,085 ÷ 240 = ?
4. 143,568 ÷ 330 = ?
5. 266,394 ÷ 420 = ?
6. 270,900 ÷ 6,300 = ?
7. 423,500 ÷ 3,500 = ?
8. 296,800 ÷ 5,300 = ?
9. 440,331 ÷ 6,200 = ?
10. 605,989 ÷ 8,900 = ?
11. There are 3,600 seconds in 1 hour; 86,400 seconds make how many hours?
12. How many trips must be made to deliver 224,000 lb. of hay, if 3,500 pounds can be delivered in one trip?
13. If a man earns $250. each month, how many months must he work to earn $9,000.?
14. A farm containing 3,005 acres was sold for $357,595.; what was the selling price of each acre?
15. A ranch containing 1,007 acres was sold for $101,707.; what was the selling price per acre?

Exercise 41—Written.

1. 470,400 ÷ 2,400 = ?
2. 798,600 ÷ 3,300 = ?
3. 434,000 ÷ 3,500 = ?
4. 2,908,200 ÷ 3,700 = ?
5. 1,142,400 ÷ 1,400 = ?
6. 280,800 ÷ 1,200 = ?
7. 285,000 ÷ 2,500 = ?
8. 1,860,300 ÷ 2,700 = ?

9. 1,858,500 ÷ 4,500 = ?

10. 3,696,390 ÷ 6,030 = ?

Make two division examples out of each of the following multiplication examples:

EXAMPLE: What is the cost of 24 typewriters @ $103. each?

MULTIPLICATION

Cost of 1 typewriter
× Number of typewriters
= Entire cost.

$103. (Cost of 1 typewriter)
×24 (Number of typewriters)
412
206
=$2,472. (Entire cost)

DIVISION

Entire cost
÷ Number of typewriters
= Cost of 1 typewriter.

=$103. (Cost of 1 typewriter)
(Number of typewriters) ÷ 24)$2472. (Entire cost)
24
72
72

Entire Cost
÷ Cost of 1 typewriter
= Number of typewriters.

=24 (Number of typewriters)
(Cost of 1 typewriter) ÷ $103.)$2472. (Entire cost)
206
412
412

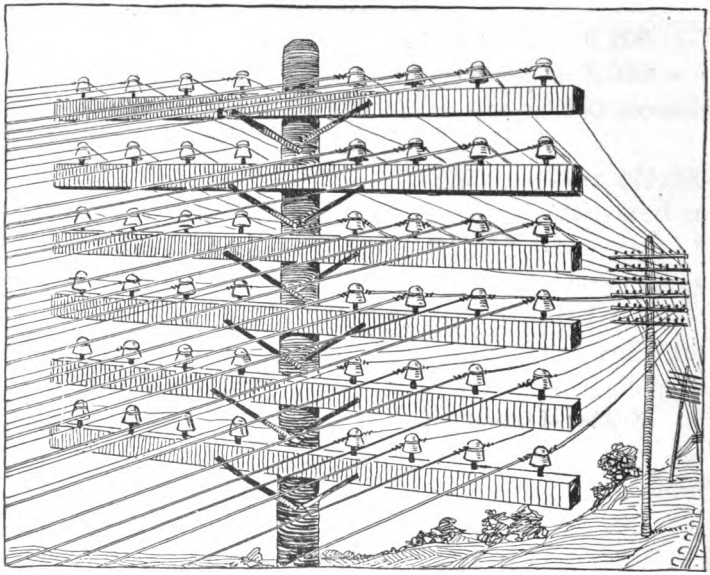
11. What is the cost of 36 pianos @ $375. each?

12. What is the cost of 48 bicycles @ $35. each?

13. A bushel of wheat weighs 60 pounds; what is the weight of 475 bushels?

14. A railroad train traveling at the rate of 45 miles an hour will travel how far in 19 hours?

15. A certain book contains 436 pages; how many pages are there in 43 such books?



16. If there are 48 insulators on a telegraph post, how many insulators are there on 150 such posts?

17. If there are 28 keys on a typewriter, how many keys are there on 72 typewriters?

18. There are 88 keys on a piano; how many keys are there on 16 pianos?

19. If there are 125 sheets of paper in a writing pad, how many sheets are there in 72 such pads?

EXAMPLE: A stationer, after packing 144 pencils in each of 23 boxes, had 38 pencils left; how many had he in all?

MULTIPLICATION

Number of pencils in 1 box
× Number of boxes
+ Remainder
= Entire number of pencils.

144 (Number of pencils in 1 box)
×23 (Number of boxes)
432
288
=3312 (Number of pencils in boxes)
+38 (Remainder)
=3,350 (Entire number of pencils)

DIVISION

Entire number of pencils
÷ Number of boxes
= Number of pencils in 1 box and shows the remainder.

(Number of boxes) ÷ 23)3350 (Entire number of pencils) = 144 (Number of pencils in 1 box) and 38 rem.
23
105
92
130
92
38 (Remainder)

Entire number of pencils
÷ Number of pencils in 1 box
= Number of boxes and shows the remainder.

(Number of pencils in 1 box) ÷ 144)3350 (Entire number of pencils) = 23 (Number of boxes) and 38 rem.
288
470
432
38 (Remainder)

(Notice that the remainder (38) is the same in both cases)

20. In making packing cases, 54 feet of lumber were used for each case; if there was enough lumber for 60 cases and 31 feet remained unused, how many feet of lumber were there in all?

21. A freight car holds 48 rolls of the paper used in printing newspapers; how many rolls were there in a shipment if there were 44 carloads and 15 rolls besides?

22. If a shoe dealer, after putting 48 pairs of shoes on each of 18 shelves, had 14 pairs left for a window display, how many pairs had he in all?

23. A gardener, after using 132 geraniums in each of 16 flower beds, had 100 geraniums left; how many had he at first?

24. An electrician, after using 42 feet of wire in each of 15 rooms, had 31 feet left; how many feet of wire had he at first?

Exercise 42—Oral Review.

1. Read: III; IX; VI; XII; VIII; IV; VII; X; XI; I; V; II.

2. Say the table we must use to sell wheat and oats. What is this table called?

3. Say the table we must use to measure the length of the blackboard. What is this table called?

4. Say the multiplication table of 8's.

5. Say the division table of 9's.

6. Say the table we must know to buy and sell milk. What is this table called?

7. Say the table used in buying sugar. What is this table called?

8. Read: 1,463; 212,060,416; 237,400; 25,001; 63,000,000.
9. Multiply each of these numbers by 10 and give the product: 735; 1,463; 74,612; 60,000,000; 35,000.
10. Give the quotient, and the remainder, if any, of each of the following: 460 ÷ 10; 364,120 ÷ 100; 87,642 ÷ 10; 937,412 ÷ 1,000; 670,000 ÷ 100.

Exercise 43—Written Review.

(Time yourself on the first five examples; then time yourself on the last five examples.)

1. 67,412 + 83,619 + 746,831 + 12 + 41,312 + 761 = ?
2. 763,128 − 46,872 = ?
3. 70,602 × 3,002 = ?
4. 46,870 ÷ 600 = ?
5. 7,468 ÷ 87 = ?
6. If an acre of land will produce 39 bushels of corn, how many acres will be required to produce 14,508 bushels?
7. If the weight of a bushel of potatoes is 60#, what is the weight of 720 bushels?
8. How many rods are there in 48 miles?
9. From Chicago, Illinois, to Buffalo, New York, is 525 miles; from Buffalo, New York, to Boston, Massachusetts, is 499 miles; how far is it from Chicago to Boston by way of Buffalo?
10. One-cent postage stamps come in sheets of 100 stamps each; how many sheets would 47,000 stamps make?

ADDITION

LESSON 29

Grouping Numbers

One of the most important things to help you to add rapidly is to learn how to group numbers in such a way that you need not add each number separately.

The first groups that you must learn to recognize are the five two-figure groups having sums of 10. Whenever one of these groups appears in an example, add 10 for the group instead of adding the figures separately:

9	or 1	8	or 2	7	or 3	6	or 4	5
1	9	2	8	3	7	4	6	5
10	10	10	10	10	10	10	10	10

EXAMPLE:

53
36
(43)
(67)
(82)
(28)
26
335

As before the sum of the first and the second figure is the first word thought or spoken; therefore, add in this way:

Units: 9; 19; 29; 35.
Tens: 8; 11; 21; 31; 33.

Practice Exercise:

Supply the figures which will complete these groups:

1	4	7	9	3	6	2	5	8
+?	?	?	?	?	?	?	?	?
10	10	10	10	10	10	10	10	10

Exercise 44—Oral.

(Practice till you can solve 6 in 8 minutes or less.)

Add, grouping by tens:

1.	2.	3.	4.	5.
56	29	83	42	21
33	32	55	81	33
47	78	57	29	57
62	61	43	32	55
38	49	62	78	35
74	47	38	41	72

6.	7.	8.	9.	10.
43	55	42	48	27
27	86	98	71	33
86	94	17	39	49
34	19	83	22	61
76	71	26	31	85
34	38	84	79	25

11.	12.	13.	14.	15.
47	73	49	36	55
39	39	33	48	45
71	61	87	62	89
62	83	23	87	62
84	27	68	44	37
26	53	42	56	43
52	56	54	93	68
58	64	56	18	71
16	98	73	47	99
45	32	27	23	38
65	78	89	31	42

ROMAN NUMERALS

LESSON 30

Expressing Numbers in Roman Numerals

You have learned that the numerals which are commonly used are called Arabic Numerals. You also know that certain capital letters are often used as numerals on watches and clocks to show the hours of

Arabic Value	Thousands	Hundreds	Tens	Units
To write 1 of any order, write the numeral which indicates 1 of that order, once.	M	C	X	I
To write 2 of any order, write the numeral which indicates 1 of that order, twice.	MM	CC	XX	II
To write 3 of any order, write the numeral which indicates 1 of that order, three times.	MMM	CCC	XXX	III
To write 4 of any order, write the numeral which indicates 1 of that order, once to the left of the numeral which indicates 5 of that order, to show that 1 is to be subtracted from 5 of that order, leaving 4.	*	CD	XL	IV
To write 5 of any order, write the numeral which indicates 5 of that order.	*	D	L	V

ROMAN NUMERALS

Arabic Value	Thousands	Hundreds	Tens	Units
To write 6 of any order, write the numeral which indicates 1 of that order, once to the right of the numeral which indicates 5 of that order, to show that 1 is to be added to 5 of that order, making 6.	*	DC	LX	VI
To write 7 of any order, write the numeral which indicates 1 of that order, twice to the right of the numeral which indicates 5 of that order, to show that 2 is to be added to 5 of that order, making 7.	*	DCC	LXX	VII
To write 8 of any order, write the numeral which indicates 1 of that order, three times to the right of the numeral which indicates 5 of that order, to show that 3 is to be added to 5 of that order, making 8.	*	DCCC	LXXX	VIII
To write 9 of any order, write the numeral which indicates 1 of that order, once to the left of the numeral which indicates 1 of the next higher order, to show that 1 is to be subtracted from 1 of the next higher order, leaving 9.	*	CM	XC	IX

No numeral is used for 0 because the value of each numeral is definite without regard to place.

*A horizontal line written over any numeral multiplies it by 1,000; therefore, as 4,000 can be written $\overline{\text{IV}}$, the letter M is not used to show thousands in numbers higher than 3,000.

the day, and in books to show the chapter numbers, etc.; these numerals, as you will remember, are called Roman Numerals.

There are only seven Roman Numerals, and you already have learned the first three of them:

Arabic:	1	5	10	50	100	500	1,000
Roman:	I	V	X	L	C	D	M

The table on the two preceding pages shows how the Roman Numerals are used.

In writing Roman Numerals, start with the figure of the highest order and write the numerals or groups of numerals which stand for each figure in the number.

EXAMPLES:

12 = XII;	75 = LXXV;
14 = XIV;	98 = XCVIII;
15 = XV;	139 = CXXXIX;
17 = XVII;	496 = CDXCVI;
19 = XIX;	527 = DXXVII;
23 = XXIII;	849 = DCCCXLIX;
25 = XXV;	980 = CMLXXX;
29 = XXIX;	1,492 = MCDXCII;
35 = XXXV;	1,918 = MCMXVIII;
44 = XLIV;	1,919 = MCMXIX.

Exercise 45—Oral.

1. What kind of numerals are most commonly used? What kind of numerals are often used on watches and clocks?
2. How many Roman Numerals are there? Name them and give their value in Arabic Numerals.

3. Write 1, 2, and 3 on the board in Roman Numerals. How do we write 1, 2, or 3 of any order in Roman Numerals?
4. How do we write 4 of any order in Roman Numerals?

5. How do we write 5 of any order in Roman Numerals?
6. How do we write 6, 7, or 8 of any order in Roman Numerals?

7. How do we write 0 in Roman Numerals?
8. What Roman Numeral stands for cipher? Why?
9. What does a horizontal line written over any Roman Numeral show?
10. How do we proceed to write any number in Roman Numerals?

Exercise 46—Oral.

Read:

1. I; III; IV; V; VI; VII; IX; X; XI; XII.
2. XIV; XV; XVIII; XIX; XX; XXIV; XXIX; XXX; XL; L.
3. LX; LXX; LXXXIX; XC; XCIV; XCIX; C; CIX; CCCXL; CCCXC.
4. CX; CD; DLV; DCCLVI; CMI; MCMXX.
5. A church had this inscription on the corner stone: "Erected MDCCCXCIII"; what does it mean?
6. In what year was the library shown in the drawing on page 75 built?
7. When you are reading in Chapter XLVII, in what chapter are you reading?
8. When you are reading in Volume XXXIX, in what volume are you reading?

Exercise 47—Written.

Write in Roman Numerals:

1.	8;	17;	23;	48;	65.
2.	116;	141;	152;	165;	193.
3.	218;	346;	497;	588;	637.
4.	862;	947;	600;	900;	1,919.

TEMPERATURE

LESSON 31

The Thermometer

When we speak of an object's warmth or coldness, we speak of its "temperature."

So that we may know exactly what the temperature of the atmosphere or any object is at any time, we use an instrument which we call a "thermometer."

The thermometer scale which is in most common use is called "Fahrenheit" and is arranged so that the freezing point of water is at 32 "degrees," and the boiling point of water is at 212 degrees.

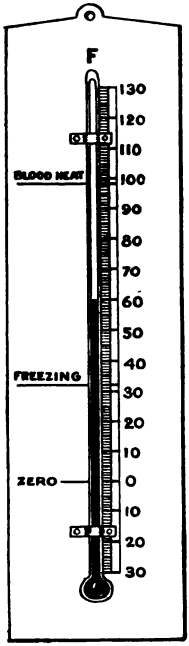
The sign used for degree or degrees is °.

Temperatures below "zero" are written after a minus sign, thus: −6; −10; etc.

Exercise 48—Oral.

1. Looking at the thermometer shown in the picture, say what degree of temperature it shows.
2. At what temperature does water freeze?
3. At what temperature does water boil?
4. The temperature of your body is about 98°; what is this called on the thermometer in the picture?
5. What is 32° below freezing point called?
6. How much warmer is your body than the atmosphere when outdoor thermometers stand at freezing point?

7. What is the difference in degrees between the highest and lowest temperature recorded for Chicago, Ill., on January 19th, as shown by this chart? Show this difference on the thermometer.



Weather Report, Jan. 19th		
City	High	Low
Albany, N. Y.	26	14
Atlanta, Ga.	30	20
Boston, Mass.	32	14
Chicago, Ill.	4	-2
Cincinnati, Ohio	12	0
Denver, Colo.	38	22
Duluth, Minn.	10	-8
Los Angeles, Calif.	68	50
Tampa, Fla.	48	40

8. What city had the highest temperature that day? Was this the warmest or coldest city?

9. What city had the lowest temperature that day? Was this the warmest or coldest city?

10. State the difference in degrees between the highest and the lowest temperature shown on this report?

11. Make 5 good temperature problems.

12. Keep a daily record of your thermometer for a month.

UNITED STATES MONEY

LESSON 32

Table

10 mills = 1 cent
10 cents = 1 dime
10 dimes = 1 dollar

10 m. = 1 ct. or ¢
10 ct. = 1 d.
10 d. = $1.

$10. is often called an Eagle.
$20. is often called a Double Eagle.

Exercise 49—Oral.

1. Say the table of United States money.
2. How many mills are there in 1 dime?
3. How many cents are there in one dollar?
4. How many cents are there in $71.00?
5. How many dimes are there in $163.00?

6. How many dollars are there in 830 dimes?
7. How many dollars are there in 1,700 cents?
8. How many dimes are there in 3,100 cents?
9. How many cents are there in one Eagle?
10. How many cents are there in one Double Eagle?
11. What part of one cent is one mill?
12. Have you ever seen a mill? (NOTE.—The mill is a value used in calculations only; it is not a coin.)

As you know, we can write 45 cents in several ways: (a) \$0.45; (b) \$.45; (c) 45¢. In writing mills, we always use the first place to the right of cents' place, and we always use form (a) or form (b), never form (c); therefore, 45 cents 5 mills is written \$0.455 or \$.455, never 455¢, as that means 455 cents or \$4.55.

13. Read:

\$1.	\$.10	\$.01	\$.001
\$.005	\$.009	\$.013	\$.154

14. Read:

\$.026	\$0.354	\$0.509	\$0.957
\$17.	\$17.00	\$17.10	\$17.101
\$135.25	\$0.003	\$76.455	\$89.056

15. Write each of these in as many ways as you can on the board:

405 dollars. 95 cents. 9 mills.
136 dollars. 450 cents. 25 mills.
45 cents 8 mills. 10 cents 6 mills.
70 cents 5 mills. 18 cents 3 mills.
145 dollars 18 cents 5 mills.
360 dollars 0 cents 2 mills.

MULTIPLICATION AND DIVISION

LESSON 33

Multiplication Table of 11's

As your knowledge of multiplication and division is quite complete, you could multiply or divide by 11 or 12 just as you would multiply or divide by any other two-figure multiplier or divisor; but 11 and 12 are used so often that we must be able to multiply or divide by them as if they were single figures like 6, 7, etc. To do this properly, you will want to know the multiplication and division tables of 11 and 12.

Give the sum of each column:

1 eleven	2 eleven's	3 eleven's	4 eleven's
11	11	11	11
	11	11	11
		11	11
			11

5 eleven's	6 eleven's	7 eleven's	8 eleven's
11	11	11	11
11	11	11	11
11	11	11	11
11	11	11	11
11	11	11	11
	11	11	11
		11	11
			11

9 eleven's	10 eleven's	11 eleven's	12 eleven's
11	11	11	11
11	11	11	11
11	11	11	11
11	11	11	11
11	11	11	11
11	11	11	11
11	11	11	11
11	11	11	11
11	11	11	11
	11	11	11
		11	11
			11

2 eleven's = 22.
3 eleven's = 33.
4 eleven's = 44.
5 eleven's = 55.
6 eleven's = 66.
7 eleven's = 77.
8 eleven's = 88.
9 eleven's = 99.
10 eleven's = 110.
11 eleven's = 121.
12 eleven's = 132.

Exercise 50—Oral.

1. Give the product of each of the following examples:

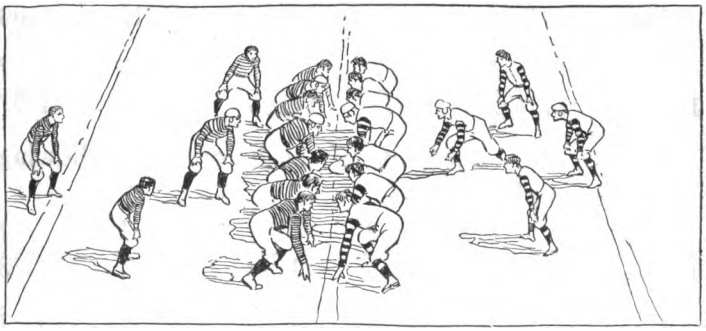
4 eleven's = ?	10 eleven's = ?
8 eleven's = ?	6 eleven's = ?
11 eleven's = ?	3 eleven's = ?
5 eleven's = ?	2 eleven's = ?
12 eleven's = ?	7 eleven's = ?
1 eleven = ?	9 eleven's = ?

2. Give the product of each of the following examples:

11	11	11	11	11	11	11	11	11	11	11	12
11	1	10	2	9	3	8	4	7	5	6	11

Exercise 51—Oral.

1. How old will you be when you are three times 11 years old?
2. How many feet are twelve times 11 feet? How many inches are 6 times 11 inches?
3. How many pints are nine times 11 pints? How many quarts are eight times 11 quarts?
4. If it takes 11 weeks to build a house, how long will it take to build 3 houses? How long will it take to build 6 houses?
5. If it takes 11 feet of rope to tie a bundle of books, how many feet will be needed to tie 8 bundles? How many feet to tie 9 bundles? How many feet to tie 11 bundles? How many feet to tie 12 bundles?
6. If each of 7 boys earns $11.00 per week, how much do they earn in all?



7. How many players are there on 2 football teams if each team has 11 players?
8. What is the cost of 5 books @ 11¢ each?

LESSON 34

Division Table of 11's

$11\overline{)11} = 1.$	$11\overline{)77} = 7.$
$11\overline{)22} = 2.$	$11\overline{)88} = 8.$
$11\overline{)33} = 3.$	$11\overline{)99} = 9.$
$11\overline{)44} = 4.$	$11\overline{)110} = 10.$
$11\overline{)55} = 5.$	$11\overline{)121} = 11.$
$11\overline{)66} = 6.$	$11\overline{)132} = 12.$

When you divide by 11, you are finding one-eleventh ($\frac{1}{11}$) of a number, and you are also finding how many 11's there are in a number.

Exercise 52—Oral.

1. Give the quotient of each of the following examples:

$11\overline{)33}$	$11\overline{)44}$	$11\overline{)66}$	$11\overline{)55}$	$11\overline{)110}$	$11\overline{)99}$
$11\overline{)121}$	$11\overline{)132}$	$11\overline{)11}$	$11\overline{)88}$	$11\overline{)22}$	$11\overline{)77}$

2. Give the quotient of each of the following examples:

$11\overline{)132}$	$11\overline{)55}$	$11\overline{)11}$	$11\overline{)88}$	$11\overline{)121}$	$11\overline{)33}$
$11\overline{)44}$	$11\overline{)110}$	$11\overline{)22}$	$11\overline{)99}$	$11\overline{)77}$	$11\overline{)66}$

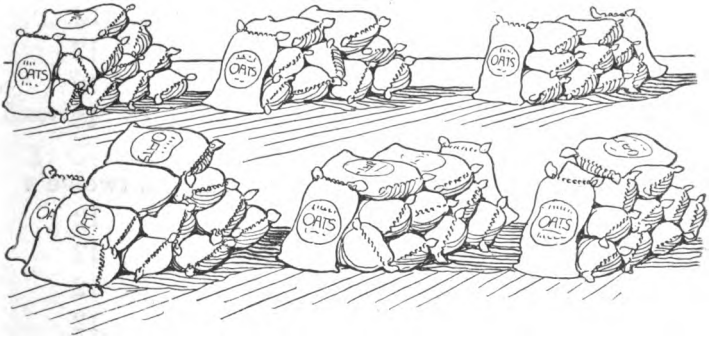
3. Find one-eleventh of 66; 99; 22; 110; 33; 132.

4. Find $\frac{1}{11}$ of 55; 11; 77; 121; 44; 88.

Exercise 53—Oral.

First say which kind of a division example each is, then give the answer:

1. A foreman divided 121 men into equal squads; 11 men were put in each squad; how many squads were there?
2. Eleven sets of books cost $110.; what was the cost of each set?
3. A man working by the day was paid $44. for 11 days' work; how much did he receive per day?
4. Ninety-nine pairs of shoes were put into cases; 11 pairs were put into each case; how many cases were there?
5. A button manufacturer put his buttons on cards so that 132 buttons made 11 cards; how many buttons did he put on each card?



6. 66 bags of oats were put into piles; 11 bags were put in each pile; how many piles were there?
7. What is one-eleventh of 44? Of 55 hours? Of 33 inches?

8. What is $\frac{1}{11}$ of 77 yards? Of \$88.? Of 66 quarts? Of 99 feet?
9. What is one-eleventh of 22? Of 33 gallons? Of 110 bushels?
10. What is $\frac{1}{11}$ of 121 hours? Of 132 minutes? Of 99 seconds?
11. The cement sidewalk in front of Mr. Rich's lot is 55 ft. long; it is divided into 11 equal parts; how long is each of the parts?
12. Mr. Grant's morning newspapers cost him \$1.32 for 11 weeks; how much is that for 1 week?

Lesson 35

Multiplication Table of 12's

Give the sum of each column:

1 twelve	2 twelve's	3 twelve's	4 twelve's
12	12	12	12
	12	12	12
		12	12
			12

5 twelve's	6 twelve's	7 twelve's	8 twelve's
12	12	12	12
12	12	12	12
12	12	12	12
12	12	12	12
12	12	12	12
	12	12	12
		12	12
			12

9 twelve's	10 twelve's	11 twelve's	12 twelve's
12	12	12	12
12	12	12	12
12	12	12	12
12	12	12	12
12	12	12	12
12	12	12	12
12	12	12	12
12	12	12	12
12	12	12	12
	12	12	12
		12	12
			12

2 twelve's = 24. 7 twelve's = 84.
3 twelve's = 36. 8 twelve's = 96.
4 twelve's = 48. 9 twelve's = 108.
5 twelve's = 60. 10 twelve's = 120.
6 twelve's = 72. 11 twelve's = 132.
12 twelve's = 144.

Exercise 54—Oral.

1. Give the product of each of the following examples:

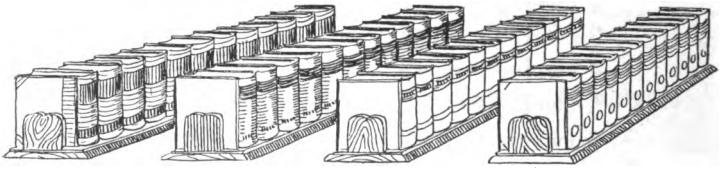
10 twelve's = ? 5 twelve's = ?
12 twelve's = ? 3 twelve's = ?
1 twelve = ? 7 twelve's = ?
4 twelve's = ? 2 twelve's = ?
6 twelve's = ? 11 twelve's = ?
8 twelve's = ? 9 twelve's = ?

2. Give the product of each of the following examples:

12	12	12	12	12	12	12	12	12	12	12	12
8	5	12	6	1	7	2	10	3	9	4	11

Exercise 55—Oral.

1. How many inches are there in 8 feet? How many in 9 ft.? How many in 11′? How many in 12 feet?
2. How many things are there in 4 dozen? How many in 5 doz.? How many in 6 dozen? How many in 7 doz.?
3. How many dozen are there in 1 gross? How many things are there in a gross?
4. How many feet are there in 3 yards? How many inches are there in 3 yards?
5. How many gr. are there in a great gross? How many doz. are there in a gt. gr.?



6. How many books are there in four sets, if each set consists of 12 books?
7. If a young man earns $12.00 each week, how much will he earn in 12 weeks?
8. If 8 boards, each 1 foot wide, are placed side by side, what is their total width in inches?
9. What is the cost of 9 tables at $12.00 each? What is the cost of 6 chairs at $12.00 each?
10. What is the cost of 7 rugs at $12.00 each? What is the cost of 8 lamps at $12.00 each?
11. What is the weight of 11 cases of crackers if each case weighs 12 lb.?

LESSON 36

Division Table of 12's

$12\overline{)12} = 1.$	$12\overline{)84} = 7.$
$12\overline{)24} = 2.$	$12\overline{)96} = 8.$
$12\overline{)36} = 3.$	$12\overline{)108} = 9.$
$12\overline{)48} = 4.$	$12\overline{)120} = 10.$
$12\overline{)60} = 5.$	$12\overline{)132} = 11.$
$12\overline{)72} = 6.$	$12\overline{)144} = 12.$

When you divide by 12, you are finding one-twelfth ($\frac{1}{12}$) of a number, and you are also finding how many 12's there are in a number.

Exercise 56—Oral.

1. Give the quotient of each of the following examples:

$\overset{?}{12\overline{)108}}$	$\overset{?}{12\overline{)72}}$	$\overset{?}{12\overline{)84}}$	$\overset{?}{12\overline{)24}}$	$\overset{?}{12\overline{)48}}$	$\overset{?}{12\overline{)144}}$
$\overset{?}{12\overline{)60}}$	$\overset{?}{12\overline{)120}}$	$\overset{?}{12\overline{)12}}$	$\overset{?}{12\overline{)96}}$	$\overset{?}{12\overline{)132}}$	$\overset{?}{12\overline{)36}}$

2. Give the quotient of each of the following examples:

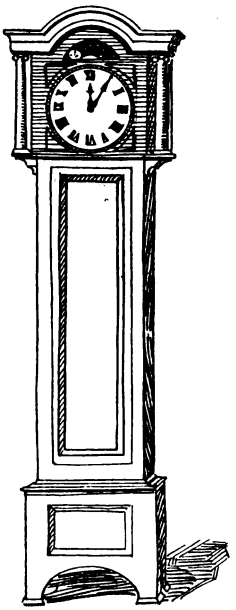
$\overset{?}{12\overline{)36}}$	$\overset{?}{12\overline{)120}}$	$\overset{?}{12\overline{)12}}$	$\overset{?}{12\overline{)108}}$	$\overset{?}{12\overline{)60}}$	$\overset{?}{12\overline{)84}}$
$\overset{?}{12\overline{)96}}$	$\overset{?}{12\overline{)24}}$	$\overset{?}{12\overline{)48}}$	$\overset{?}{12\overline{)72}}$	$\overset{?}{12\overline{)144}}$	$\overset{?}{12\overline{)132}}$

3. Find one-twelfth of 96; 132; 36; 108; 24; 72.
4. Find $\frac{1}{12}$ of 60; 84; 120; 12; 48; 144.

Exercise 57—Oral.

First say which kind of a division example each is, then give the answer:

1. If it took a man 144 minutes to pack 12 cases of merchandise, how long did it take him to pack each case?
2. If it takes a man 12 minutes to pack a case of merchandise, how many cases can he pack in 96 minutes? How many in 60 minutes?



3. A freight train traveling at the rate of 12 miles an hour would take how many hours to travel 72 miles?
4. A merchant in the shoe business wanted to ship 132 pairs of shoes; how many cases were needed if he packed 12 pairs in each case?
5. As it takes 12 hours for the hour-hand on a clock to go around the dial once, how many times will it go around in 84 hours?
6. If 12 boards placed end to end are 60 ft. long, how long is each board?
7. What is one-twelfth of 48 lb.? Of 72 gal.?
8. How many minutes are there in $\frac{1}{12}$ of an hour?
9. How many hours are there in $\frac{1}{12}$ of a day?
10. How many things are there in $\frac{1}{12}$ of a dozen?

Exercise 58—Oral Review.

1. Read: XIX; LXVI; CXIV; CDXX; CMVI.
2. At what degree of temperature does water freeze?
3. How many quarts are there in 12 pecks?
4. What is the normal temperature of your body?
5. Say the table of United States money.
6. How many pecks are there in 10 bushels?
7. Say the division table of 11's.
8. Say the multiplication table of 12's.
9. Say the table of Linear Measure.
10. Say the table of Avoirdupois Weight.

Exercise 59—Written Review.

1. If a grocer's receipts for Monday were \$56.13, for Tuesday \$43.00, for Wednesday \$46.46, for Thursday \$42.75, for Friday \$39.11, and for Saturday \$77.31, what were his total receipts for the week?
2. If a clerk receives \$18.00 each week, how long will he have to work to earn \$936.00?
3. $746 \times 319 = ?$
4. $439 - 394 = ?$
5. $368 \div 211 = ?$
6. $467 + 312 = ?$
7. What will it cost to pave 32 blocks of street with concrete, if 1 block costs \$5,472.?
8. What is one-ninth of 416,313?
9. $\frac{1}{8}$ of 463,424 = ?
10. An empty wagon weighed 3,600 lb.; after loading with coal, the loaded wagon weighed 12,600 lb.; what was the weight of the coal?

ARITHMETIC

Lesson 37

11 or 12 as Multiplier or Divisor

EXAMPLE: $345 \times 11 = ?$

345	11 fives = 55; write 5 units and carry 5 tens.
11	
3,795	11 fours = 44; 44 + 5 = 49; write 9 tens and carry 4 hundreds.
	11 threes = 33; 33 + 4 = 37; write 37 hundreds.

Whenever the multiplier of an example is 11 or 12, the multiplication should be made without using partial products, in exactly the same manner as when the multiplier is a single figure.

EXAMPLE: $48{,}732 \div 12 = ?$

	48 ÷ 12 = 4; write 4 in thousands' place.
4,061	7 ÷ 12 = 0 and 7 rem.; write 0 in hundreds' place and change 7 hundreds into tens.
12)48732	73 ÷ 12 = 6 and 1 rem.; write 6 in tens' place and change 1 ten into units.
	12 ÷ 12 = 1; write 1 in units' place.

Whenever the divisor of an example is 11 or 12, the example should be worked by short division without using partial dividends, in exactly the same manner as when the divisor is a single figure.

Exercise 60—Written.

Copy, find the answer, and prove:

1.	462 × 12 = ?	**11.**	46,024 ÷ 11 = ?
2.	5,317 × 11 = ?	**12.**	38,424 ÷ 12 = ?
3.	4,218 × 12 = ?	**13.**	36,842 ÷ 11 = ?
4.	8,312 × 11 = ?	**14.**	2,872 ÷ 12 = ?
5.	3,004 × 12 = ?	**15.**	4,009 ÷ 11 = ?
6.	219 × 11 = ?	**16.**	2,876 ÷ 12 = ?
7.	4,382 × 12 = ?	**17.**	93,041 ÷ 11 = ?
8.	6,731 × 11 = ?	**18.**	24,242 ÷ 12 = ?
9.	1,944 × 12 = ?	**19.**	31,092 ÷ 11 = ?
10.	6,053 × 11 = ?	**20.**	55,548 ÷ 12 = ?

(Practice until you can do the last 4 in 8 minutes.)

Lesson 38

11 or 12 as Partial Multipliers

EXAMPLE:	**EXAMPLE:**	**EXAMPLE:**
642 × 411 = ?	2,916 × 123 = ?	2,342 × 1,112 = ?
642	2916	2342
411	123	1112
7062	8748	28104
2568x	34992	25762x
263,862	358,668	2,604,304

Whenever the figures 11 or 12 are part of a multiplier, they should be used as a single multiplier, producing a single partial product, the other partial products being written in their proper places.

Do you see how 11 and 12 are used as single figures in the above examples?

Exercise 61—Written.

Copy, multiply, and prove:

1. $434 \times 212 = ?$
2. $872 \times 311 = ?$
3. $421 \times 124 = ?$
4. $873 \times 116 = ?$
5. $1{,}432 \times 1{,}211 = ?$
6. $6{,}213 \times 1{,}112 = ?$
7. $21{,}423 \times 1{,}141 = ?$
8. $31{,}615 \times 1{,}211 = ?$
9. $21{,}432 \times 1{,}114 = ?$
10. $23{,}541 \times 1{,}012 = ?$
11. At \$212. per acre, what is the cost of 565 acres of land?
12. A shoe factory which produces 4,325 pairs of shoes each day, produces how many pairs in 128 da.?
13. How many envelopes will a girl address in 125 da., if she addresses 1,200 each day?
14. When hay is worth \$11.12 per ton, what is the value of 5,275 T.?
15. If 112 A. of land produce a wheat crop worth \$2,912., what is the value of the crop produced by 1 A.? By 75 A.?
16. If 211 A. of land produce a corn crop worth \$2,818.96, what is the value of the crop produced by 12 A.? (What must you find first?)
17. If 445 T. of coal cost \$3,608.95, what is the cost of 122 T.?
18. If 168 gr. of eggs cost \$729.12, what is the cost of 112 gr.?
19. A foundry made 369 castings, each weighing 211 lb.; what was the total weight?
20. An orchard containing 412 trees produced 3 bbl. of apples to the tree; if these were sold at \$2.12 per barrel, how much was received for all the apples?

ADDITION

Lesson 39

Grouping Numbers

When a group of 10 is to be added to 3, 4, 5, 6, 7, 8, or 9, just add the syllable "teen" without repeating the other syllable of the word; thus:

EXAMPLE:

46
33
85
25
189

Units: *Nine; Teen.* (Not *Nine; Nineteen.*)
Tens: Five; *Eight; Teen.* (Not Five; *Eight; Eighteen.*)

In doing this, it is not permissible to say "Three; Teen;" instead of "Thirteen;" nor "Five; Teen;" instead of "Fifteen."

Exercise 62—Oral.

Add:

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
66	73	22	61	64	48	54	34	12	22
23	41	53	22	63	21	34	41	11	63
82	67	56	89	45	82	77	64	95	49
48	33	44	41	55	98	23	76	25	81
63	86	69	63	39	43	48	92	47	27
29	54	41	77	41	36	82	18	63	42

SQUARE MEASURE

LESSON 40

The Difference Between One and Two Dimensions

If you were asked to measure the length of your desk, you would measure with a ruler or tape to find the "distance" from a point at one end of the desk to a point at the other end directly opposite the first point, and you would measure on a straight line as that is the shortest distance between two points.

If you were asked to measure the width of your desk, you would also measure "distance," only in a different direction; so you see, to measure "distance" we always measure a straight line between two objects or two points, and our answer is always stated in line (linear) measure, as, inches, feet, yards, miles, etc.

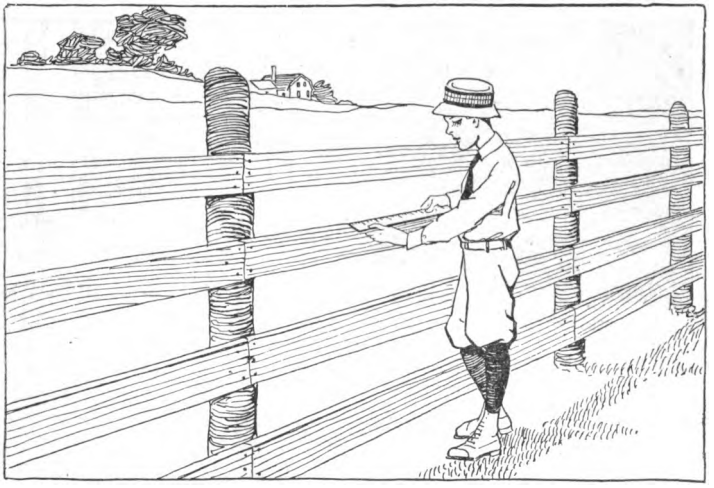
Therefore, as a "line" can be measured only in one way, we say that it has only "one dimension" and that is "length."

The "surface" of your desk, however, is different, because it can be measured for its length and also for its width; therefore, we say that a "surface" has "two dimensions"—"length" and "width," and the space within the boundaries of any "surface" is called its "area."

Now, just as we measure a straight line by using "Linear Measure" which is a measure of only "one dimension" because the straight line has only "one dimension," so we measure the area of a surface by

using "Square Measure" which is a measure of "two dimensions" because the area has "two dimensions."

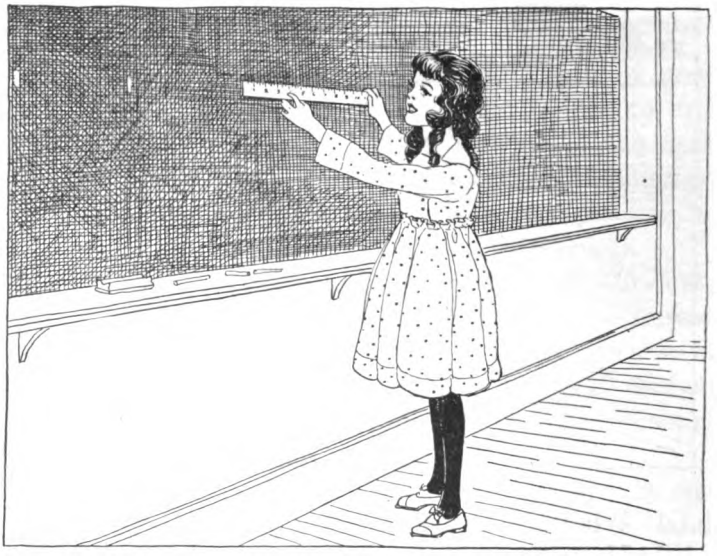
Exercise 63—Oral.



1. What is a straight line?
2. How many dimensions has a straight line? Name?
3. What table of measures do we use to measure length or distance? Say this table of measures.
4. Linear Measure is a measure of how many dimensions?
5. Square Measure is a measure of how many dimensions?
6. How many dimensions has a surface? Name them.
7. What is the space within the boundaries of a surface called?

8. What table of measures do we use to measure area?

9. What measure would you use to find the area of the surface of the blackboard?



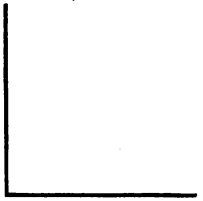
10. Name some things in the room that can be measured by Linear Measure. By Square Measure.

LESSON 41

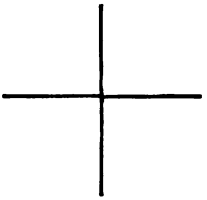
Angles, Squares, and Oblongs

Whenever two lines meet in a point, they form an "angle" and when they meet in such a way that if the lines were lengthened to cross each other all four angles

would be exactly alike, then the angle is called a "right angle."

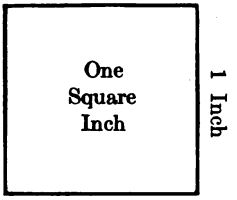


A Right Angle

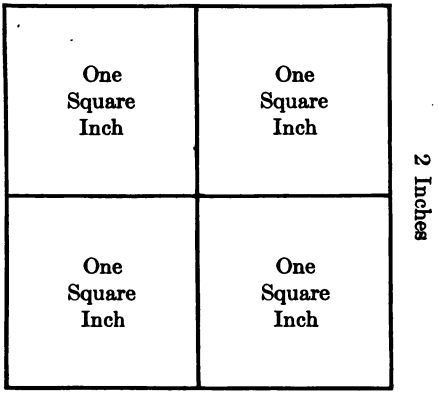


Four Right Angles

A "square" is a plane figure formed by joining the ends of four lines of equal length so that they form four "right angles," and when each of the sides of a square is 1 inch long, the area of the square is "1 square inch."

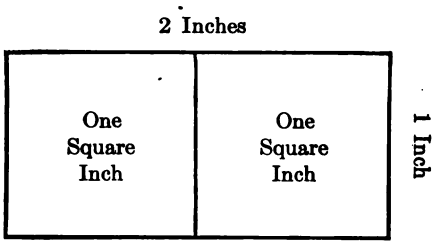


A One-inch Square Containing One Square Inch



A Two-inch Square Containing Four Square Inches

An "oblong" has four right angles the same as a square, but two of its sides are longer than the other two.



An Oblong
Containing
Two Square Inches

You will notice that the "oblong" in the picture contains 2 square inches, because, although it is only 1 inch wide, it is 2 inches long. Its area, therefore, is twice as great as the area of the small one-inch square.

The large square contains 4 square inches, because it is not only 2 inches long, but it is also 2 inches wide. Its area, therefore, is twice as great as that of the oblong, or 4 times as great as that of the small one-inch square.

From this you see that when we multiply the number of square inches in one row by the number of rows in the width, we find the number of "square inches" in the area; thus:

1 square inch in each row × 1 (the number of rows) = 1 square inch.

2 square inches in each row × 1 (the number of rows) = 2 square inches.

2 square inches in each row × 2 (the number of rows) = 4 square inches.

When the sides are measured in feet, the multiplication will give the area in "square feet." When the

sides are measured in yards, the result is "square yards," and so on.

Squares and oblongs are "rectangles" because they are bounded by four straight lines and have four right angles.

In writing dimensions, the sign of multiplication ($\times$) is used to indicate that the number of square units in one row must be multiplied by the number of rows to find the area.

Exercise 64—Oral.

1. When two lines meet in a point, what do they form?
2. When two lines cross so that all four angles are exactly alike, what kind of angles are formed?
3. Point out several right angles that you see in this room.
4. What is the name of the figure formed by joining the ends of four straight lines of equal length, in four right angles?
5. What is the area of a square if each of its sides is 1 inch long? Draw such a square.
6. What is the name of the figure which has four right angles the same as a square, but two of its sides are longer than the other two?
7. What is the area of an oblong 1 inch wide and 3 inches long? Draw such an oblong. Show the 3 square inches.
8. The area of the oblong in Question 7 is how many times as great as the area of the square in Question 5? Why?

9. What is the area of a square if each of its sides is 3 inches long? Draw such a square. Show the number of square inches in 1 row.
10. How many times greater is the area of the square in Question 9 than the area of the oblong in Question 7? Why? How many times greater than the area of the square in Question 5? Why?
11. What is the rule for finding the area of a surface?
12. When the sides of a rectangle are measured in inches, the multiplication will give the area in what? When the sides are measured in feet what will the area be? When the sides are measured in yards what will the area be? When the sides are measured in miles what will the area be?
13. What is a rectangle? Is a square a rectangle? Is an oblong a rectangle?

Exercise 65—Oral.

1. What is the area of each of these squares:

2″ long 2″ wide;	5′ long 5′ wide;
3″ long 3″ wide;	8′ long 8′ wide;
4″ long 4″ wide;	9′ long 9′ wide;

10 yd. long 10 yd. wide;
11 rd. long 11 rd. wide;
12 mi. long 12 mi. wide.

2. What is the area of each of these oblongs:

2″ wide 4″ long;	2′ wide 6′ long;
3″ wide 5″ long;	3′ wide 7′ long;
4″ wide 5″ long;	5′ wide 6′ long;

4 yd. wide 7 yd. long;
8 rd. wide 9 rd. long;
3 mi. wide 6 mi. long.

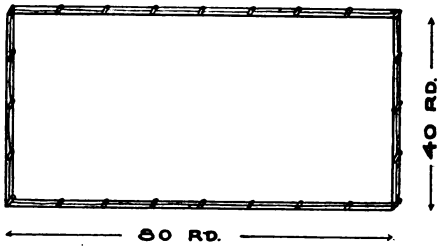
3. Say what kind of rectangles each of the following are, and give the area of each:

6″ wide 6″ long;
6″ wide 8″ long;
7′ wide 7′ long;
8 yd. wide 10 yd. long;
8 mi. wide 8 mi. long;
9 ft. wide 12 ft. long;
9 yd. wide 9 yd. long;
4 rd. wide 6 rd. long;
2 in. wide 2 in. long.

Exercise 66—Written on Board.

1. Measure the length and width of your desk to the nearest inch and say how many square inches it contains.
2. Measure the length and width of the blackboard to the nearest foot and give its area.
3. How many square yards are there in the front blackboard?
4. At $3.00 for each square yard, what would it cost to carpet a room 4 yd. long 5 yd. wide?
5. What is the area of a wall 11′ wide 14′ long?
6. What is the area of a fence 4′ wide 100′ long?
7. If netting is worth 3¢ per square foot, how much would it cost to cover a fence 5′ wide 75′ long?
8. If carpet is worth $8.00 per square yard, how much would it cost to cover the floor of a room 5 yd. wide 6 yd. long?

9. What is the area of a field 40 rd. wide and 80 rd. long?



10. What is the area of a city 4 miles wide and 8 miles long? If there are 20,000 people living in each square mile of this city, what is the total population?
11. What is the area of a storm-door 84″ high and 30″ wide?
12. If window glass costs 40¢ per square foot, what is the cost of 8 panes 2 ft. wide and 3 ft. high? What is the cost of 12 panes 3 ft. wide and 4 ft. high?

Lesson 42

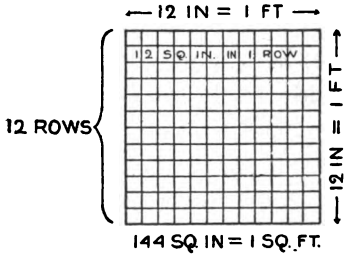
Square Measure

(Used for measuring the Area of Surfaces such as floors, ceilings, walls, blackboards, paper, grass plots, rugs, etc.)

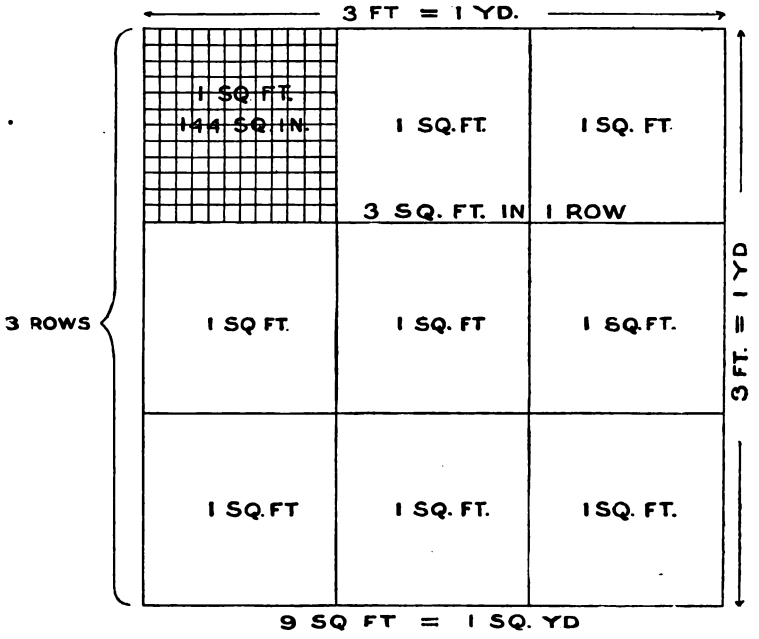
144 square inches = 1 square foot
9 square feet = 1 square yard

144 sq. in. = 1 sq. ft.
9 sq. ft. = 1 sq. yd.

SQUARE MEASURE



(12 sq. in. × 12 = 144 sq. in.)



(3 sq. ft. × 3 = 9 sq. ft.)

Exercise 67—Oral.

1. A square foot is a square 1′ long 1′ wide or 12″ long 12″ wide; why are there 144 square inches in 1 square foot?
2. Why are there 9 sq. ft. in 1 sq. yd.?
3. How many square feet are there in 6 sq. yd.? In 8 sq. yd.?
4. How many sq. in. are there in 10 sq. ft.? (144 sq. in. × ?)
5. Say the table of Square Measure.
6. How many square yards are there in 54 sq. ft.?
7. How many sq. yd. are there in a rectangle 9′ wide 10′ long?
8. At $4.00 per square yard, what will it cost to carpet a floor 12′ long 9′ wide?

Lesson 43

To Find Length or Width

As you multiplied the number of square units along the length by the number of rows in the width to find area, you divide area by the number of square units along the length to find the width, or you divide area by the width to find the number of square units along the length.

Square units in 1 row × number of rows = square units in area.

Square units in area ÷ square units in 1 row = number of rows.

Square units in area ÷ number of rows = square units in 1 row.

EXAMPLE: What is the length of an oblong which is 2″ wide, and which has an area of 8 sq. in.?

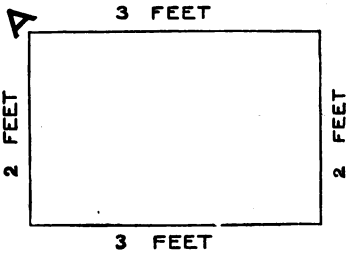
ANSWER: $8 \div 2 = 4$; therefore, if the area is 8 sq. in. and the width 2 in., the length must be 4 in.

The distance around the four sides of a rectangle is called its "perimeter." Perhaps you would like to remember that word.

The "perimeter" is obtained by finding the sum of the four sides:

3 ft. + 2 ft. + 3 ft. + 2 ft. = 10 ft., the perimeter.

Start at A and measure the perimeter with a ruler—how long is it?



Exercise 68—Oral.

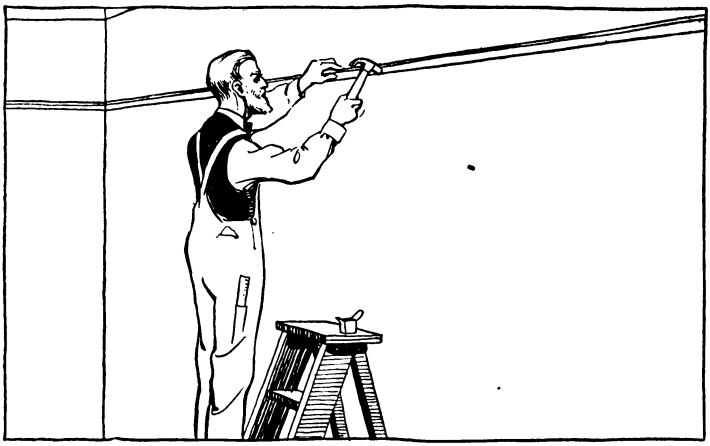
1. What is the width of an oblong 8″ long, its area being 48 sq. in.?
2. What is the length of an oblong 10″ wide, its area being 160 sq. in.?
3. A rectangle is 9 yards long; its area is 81 sq. yd.; what is its width? Is this an oblong or a square?
4. The area of a rectangle is 63 sq. ft.; its length is 9 ft.; what is its width? What kind of a rectangle is it?
5. The area of a rectangle is 90 sq. ft.; its length is 10 ft.; what is its width? What kind of a rectangle is it?

6. The area of a certain room is 270 sq. ft.; its width is 10 ft.; what is its length in yards?
7. A wall is 12 feet long and contains 144 sq. ft.; what is the height of this wall?
8. A hall is 4 ft. wide and contains 40 sq. ft.; how long is this hall?
9. A strip of carpet 3′ wide contains 66 sq. ft.; how long is it?
10. A certain rug contains 144 sq. ft.; if this is a square rug, what is its length and width?

Exercise 69—Oral and Written.

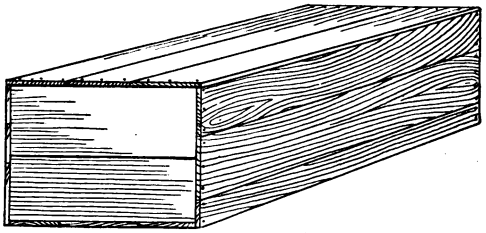
A. First tell how to work these examples:

1. What is the area of a farm 635 yards long and 468 yards wide?



2. How many feet of moulding will be needed to go around a room 16′ wide 18′ long? What is the perimeter of this rectangle?

3. What is the length of a potato field if it has an area of 92,637 square yards and its width is 219 yards?
4. How many square feet of netting will be needed to make the four sides of a chicken coop if the coop is 10′ on each side and the sides are 4 feet high?



5. How many sq. ft. of lumber will be needed to make the four sides and the top and bottom of a box if the top of the box is 6′ long 4′ wide and the sides are 3′ high?
6. How much greater is the area of a field 100 yd. long 75 yd. wide, than the area of a field 36 yd. wide 200 yd. long?
7. How much longer is a building lot which has an area of 3,750 sq. ft. and is 30 ft. wide, than a building lot which has an area of 3,000 sq. ft. and is 25 ft. wide?
8. What is the difference between the length and the width of a room, if the area of the room is 396 sq. ft. and the width is 18′?
9. What is the total area of two gardens, one being 20′ wide 24′ long, and the other being 24′ wide 30′ long?

10. How many square feet of oilcloth are needed to cover two rooms 14′ wide 16′ long and a connecting passage 5′ wide 8′ long?

11. How many strips of carpet 1 yd. wide are needed to cover a parlor 5 yd. wide and 6 yd. long, if the carpet is laid the long way of the room? How many if laid the short way?

12. What is the length of each strip if the carpet in Question 11 is laid the long way of the room? If laid the short way?

13. How many linear yards of the carpet mentioned in Questions 11 and 12 are needed? (NOTE.—A linear yard, also sometimes called a "running yard," of any material is a piece 1 yd. long regardless of the width of the material.)

14. What is the carpet in Question 13 worth @ $2.75 per yard? (NOTE.—In speaking of a "yard" of material, linear yard is meant unless square yard is mentioned.)

15. How many yards of carpet 1 yd. wide, laid lengthwise, will be needed for a room 14′ × 18′? (NOTE.—Here we must use 5 lengths, even though 1 length has a strip 1 ft. wide which must be turned under or cut off.)

How many yards of carpet 1 yd. wide, laid lengthwise, are needed for each of these rooms:

16. 9′ × 12′; **20.** 14′ × 15′;
17. 12′ × 15′; **21.** 17′ × 18′;
18. 18′ × 19′; **22.** 16′ × 17′;
19. 18′ × 20′; **23.** 17′ × 20′.

B. Now work all of them.

ADDITION

LESSON 44

Grouping Numbers

Whenever the partial sum of a column can be expressed in even tens, as "twenty," "thirty," "forty," "fifty," "sixty," "seventy," "eighty," or "ninety," the next figure can be added by merely saying it and not repeating the tens, thus:

EXAMPLE:

49	Units: Twelve; *Twenty; Six;* Thirty-six. (Not Twelve; *Twenty; Twenty-six;* Thirty-six.)
83	
(58	Tens: Seven; Fifteen; *Twenty; Two;* Thirty-two. (Not Seven; Fifteen; *Twenty; Twenty-two;* Thirty-two.)
26)	
(47	
63)	
326	

Exercise 70—Oral.

(Time yourself. Can you do the first 6 in 8 minutes?)

Add, grouping wherever possible:

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
98	89	56	65	87	89	73	68	93	78
(76	89	58	49	93	89	99	74	79	98
86)	52	72	66	88	72	38	38	66	84
37	97	44	83	92	54	94	83	82	33
(96	67	98	39	39	88	88	37	67	99
67)	86	78	98	27	68	48	96	98	78
59	79	52	67	43	64	76	44	57	76

AVERAGE

LESSON 45

How to Find the Average

When an example contains two numbers, one high and one low, it is sometimes necessary to find one *middle* number which is half way between the two numbers. If we do this, we get the "average." We can also find the average of several unequal numbers. It is found by adding the several unequal numbers and dividing the sum by the number of addends.

What number is half way between 10 and 12? Between 40 and 60? Between 20 and 24?

EXAMPLE: A man bought 2 overcoats, paying $25.00 for one and $35.00 for the other; what was the average cost?

ANSWER: Cost of 1 coat, $25.00
Cost of 1 coat, 35.00
Cost of 2 coats, $60.00 ÷ 2 = $30.00, average cost.

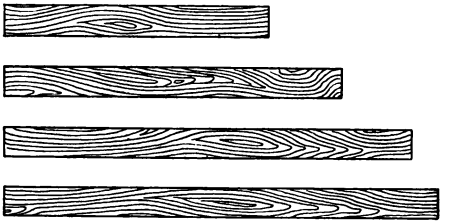
In other words, if he had paid $30.00 for each of the 2 coats, the total cost would have been the same as when he paid $25.00 for one and $35.00 for the other.

Notice that the average of two numbers is always exactly half-way between the two. In this case, $30.00 is $5.00 more than $25.00 and $5.00 less than $35.00.

Exercise 71.—Oral and Written.

1. A man bought two horses, paying $50.00 for one and $70.00 for the other; what was the average cost of each horse?

2. A train ran 40 miles, 50 miles, and 60 miles in 3 hours; how many addends have you? What number must you divide by? What was the average speed of the train for 1 hour?
3. On January 3d, the highest temperature in Chicago, Illinois, was 24° and the lowest temperature was 12°; what was the average temperature that day?
4. Four machines weigh 1,500 lb., 1,700 lb., 1,900 lb., and 2,100 lb.; how many addends have you? What number must you divide by? What is the average weight of each machine?
5. A man walked 3 miles in 16, 18, and 20 minutes; what was the average time for each mile?



6. Four boards measure 11, 14, 17, and 18 feet in length; what is the average length of each board?
7. Four tanks hold 1,225, 1,375, 1,400, and 1,600 gallons; what is the average capacity of each tank?
8. Three bins hold 250, 275, and 375 pounds of sugar; what is the average capacity of each bin?
9. Four trains run from New York to Chicago, in 20, 21, 23, and 24 hours; what is the average running time of each train?
10. Five farms contain 200, 275, 325, 400, and 450 acres; what is the average size of each farm?

BUYING AND SELLING

LESSON 46

Sales-Slips or Bills

When you go to a store to buy anything, you are the "buyer" and the storekeeper is the "seller."

In all large stores and in some small ones, a "sales-slip," "sales-check," or "bill" such as is here shown is written by the clerk who makes the sale.

The sales-slip is then "receipted" by the cashier who receives the money stamping on it the words "PAID" or "RECEIVED PAYMENT"; it is then given back to you.

If the merchandise is not paid for, the amount of the sale is charged to your "account" by the bookkeeper; in which case the sales-slip or bill is not receipted by the cashier.

If you have a complaint to make or wish to exchange the merchandise, you use the sales-slip to prove that you bought the merchandise at that particular store, and to show how much was paid or charged for it.

Exercise 72—Oral.

1. What name is given to the person who buys? What name is given to the person who sells?
2. Is the customer the buyer or seller?
3. What is a sales-slip, sales-check, or bill?
4. What does the cashier do when the goods are paid for?

Sales-Slip, Sales-Check, or Bill

SMITH & CO.

CHICAGO, ILLINOIS

Name Mrs. Chas. Brown

Address 4199 Michigan Ave.

DEPARTMENT	CLERK	AM'T REC'D	DATE
14	5	$60.00	2/5/18

Quantity	Articles	Price	Dollars	Cts.
3	Rugs	5.00	15	00
6	Chairs	4.00	24	00
1	Table	15.00	15	00
		Total	54	00

PAID
Feb. 5, 1918
SMITH & CO.

5. Why does the bookkeeper keep an account with the customer when the goods are not paid for?
6. On the sales-slip shown in the picture, who is the buyer? Who is the seller?
7. Does this sales-slip show a cash sale or a charge sale? How do you know?
8. Name the quantities of each kind of article shown on this sales-slip. Name the price for which one of each article was sold.
9. What do the amounts in the right-hand column show? How were they obtained?
10. What does the amount at the bottom show?
11. How much money was given to the clerk? How much change was given to the customer?

Exercise 73—Written.

Find the total amount of the purchases on each of the following sales-slips:

1.	2 doz. Oranges	@	30¢	= ?
	3 doz. Bananas	@	20¢	= ?
	2 doz. Lemons	@	25¢	= ?
				?
2.	6 Palms	@	$2.00	= ?
	8 Ferns	@	1.25	= ?
	10 Rubber Plants	@	3.00	= ?
				?
3.	12 Vocal Selections	@	35¢	= ?
	4 Violin Studies	@	75¢	= ?
	9 Piano Solos	@	50¢	= ?
				?

4.	3 lb. Tea	@	50¢	= ?
	4 lb. Coffee	@	30¢	= ?
	5 lb. Sugar	@	6¢	= ?
				?
5.	4 yd. Muslin	@	15¢	= ?
	7 yd. Toweling	@	25¢	= ?
	8 yd. Gingham	@	20¢	= ?
				?
6.	4 lb. Lard	@	30¢	= ?
	12 lb. Mutton	@	32¢	= ?
	7 lb. Beef	@	25¢	= ?
				?
7.	5 sets Hinges	@	$0.50	= ?
	6 sets Springs	@	1.25	= ?
	9 Door Stops	@	0.40	= ?
	8 sets Window Catches	@	0.05	= ?
				?
8.	9 Hammers	@	$0.50	= ?
	8 Chisels	@	0.75	= ?
	5 Saws	@	2.50	= ?
	6 Bits	@	0.30	= ?
	5 Planes	@	4.00	= ?
				?

Rule paper and write sales-slips for each of the following:

9. 3 pr. Shoes @ $4.00; 6 pr. Rubbers @ 75¢; 4 pr. Laces @ 5¢; 1 bottle Polish @ $0.10.

10. 6 Chairs @ $3.00; 2 Tables @ $15.00; 3 Rugs @ $6.50; 1 Lamp @ $10.00.

11. 12 Collars @ 15¢; 4 Ties @ $1.00; 3 pr. Gloves @ $2.50; 2 Hats @ $3.00.
12. 8 Books @ 40¢; 4 boxes Writing Paper @ 50¢; 3 doz. Pens @ 10¢; 7 doz. Pencils @ 30¢.

Exercise 74—Oral Review.

1. Say the table of Square Measure.
2. How many pecks are there in 48 quarts?
3. Say the multiplication table of 11's.
4. Say the division table of 12's.
5. What is the area of a board 12″ long 12″ wide?
6. Say the table of United States money.
7. Read: XXIV; XCIX; CDXVI; MCMXX; $\overline{\text{V}}$I.
8. At what degree of temperature does water freeze?
9. At what degree of temperature does water boil?
10. What are the names of the periods which you know?
11. What are the names of the places in the periods which you know?

Exercise 75—Written Review.

1. If you make 90 in arithmetic on Monday, 80 on Tuesday, 100 on Wednesday, 100 on Thursday, and 80 on Friday, what is your average mark for the week?
2. In a certain school there were 46 children in Room 1, 50 in Room 2, 48 in Room 3, 48 in Room 4; how many children were there in all? What was the average number in each room?
3. How many pounds are there in 468 T.?
4. How many sq. in. are there in 8 sq. ft.?

5. If an acre of land yields 43 bu. of corn, what will be the yield of 13,792 acres?
6. If corn is worth $1.25 per bushel, what is the value of 113,000 bu.?
7. 4,624 × 4,300 = ?
8. 36,874 ÷ 312 = ?
9. 87,463 − 39,618 = ?
10. 76,431 + 68,742 = ?

Answer the following about a room which is 15 ft. square and 9 ft. high:

11. What is the area of the floor in sq. ft.? In sq. yd.?
12. What is the area of the ceiling in sq. ft.? In sq. yd.?
13. What is the area of each wall in sq. ft.? In sq. yd.?
14. What is the area of the four walls in sq. ft.? In sq. yd.?
15. What is the area of the four walls and ceiling in sq. ft.? In sq. yd.?
16. Find the cost of plastering the walls and ceiling of this room @ 35¢ per sq. yd.
17. Find the cost of painting the walls and ceiling of this room @ 25¢ per sq. yd.

Find the number of square yards in the walls and ceiling of each of the following rooms; also find the cost of painting each room:

18. 9′ × 12′ and 9′ high @ 30¢ per sq. yd.
19. 12′ × 15′ and 9′ high @ 28¢ per sq. yd.
20. 15′ × 18′ and 9′ high @ 40¢ per sq. yd.
21. 18′ × 24′ and 12′ high @ 35¢ per sq. yd.

DEFINITIONS

(Parts I to IV, Inclusive.)

Abstract Number....A number which is used without the name of an object.

Account.....A record showing all business transactions with any person.

Addends.....The numbers which are to be added in an example in addition.

Addition.....Uniting two or more numbers or quantities into one number or quantity.
The numbers to be added are called "addends."
The answer is called the "sum" or "total."
The sign of addition is (+) which is called "plus."

Angle.....The opening between two straight lines which meet in a point.

Arabic Numerals....The numbers in common use, as 1, 2, 3, etc.

Area.....The space within the limits or boundaries of a surface.

Arithmetic.....The science of numbers.

Average.....A medium number which can be used in place of each of several unequal numbers.

Avoirdupois Weight..The table of weights used for weighing all common articles, such as groceries, meats, hay, etc.

Bill.....See "Sales-slip."

Buyer.....One who buys.

Carry.....To convert 10 of any order into 1 of the next higher order.

Change.....To convert 1 of any order into 10 of the next lower order.

Concrete Number...A number which is used with the name of an object.

Counting.....To name one by one to find the number of units in a group.

Difference.....The answer found by subtraction.

Digit.....Any single figure, as 1, 2, 3, 4, 5, 6, 7, 8, 9, 0.

Dimension.....The extent of a line, area, or solid.

Divided by (÷).....The sign of division.

DEFINITIONS

Dividend.....The number to be divided in an example in division.

Division.....Finding how many times one number is contained in another number, and finding one of the equal parts of a number.

The number to be divided is called the "dividend."

The number which shows into how many parts the dividend is to be divided, or which shows the size of the parts when the number of parts is to be found, is called the "divisor." The divisor is the number you divide by.

The answer is called the "quotient."

The sign of division (÷) is called "divided by."

Divisor.....The number which shows into how many parts the dividend is to be divided, or which shows the size of the parts when the number of parts is to be found, in an example in division. The number you divide by.

Dry Measure.....The table of measures used in measuring grains, fruit, vegetables, etc.

Equals (=).....The sign of equality.

Even Numbers.....All numbers divisible by 2 without remainder; therefore, all numbers with 0, 2, 4, 6, or 8 in units' place.

Fraction.....A number which shows one or more of the equal parts of a unit.

Group.....Several persons or things.

Hundreds of Millions' Place....The place of the 9th order.

Hundreds of Thousands' Place..The place of the 6th order.

Hundreds' Place....The place of the 3d order.

Linear Measure.....The table of measures used for measuring lines and distances.

Liquid Measure.....The table of measures used for measuring common liquids.

Location.....One object's or number's position in relation to the other objects or numbers in a group.

Long Division.....The method of division in which partial dividends are written.

Loss.....The difference between the cost and the selling price, when the cost is the greater.

Merchandise.....Any articles which can be bought and sold.

Merchandise Counting Table...The table used for counting merchandise of all kinds.

Millions' Period....Millions', Tens of Millions,' and Hundreds of Millions' places.

Millions' Place.....The place of the 7th order.

Minuend.....The number from which we subtract in an example in subtraction.

Minus (−).....The sign of subtraction.

Mixed Number.....A number which shows one or more units, plus one or more parts of a unit; therefore, a combination of a whole number and a fraction.

Multiplicand.....The number which is to be repeated in an example in multiplication.

Multiplication.....Finding a number or quantity by repeating another number or quantity a given number of times.

The number which is to be repeated is called the "multiplicand."

The number which shows how many times the multiplicand is to be repeated, is called the "multiplier."

The answer is called the "product."

The sign of multiplication (×) is called "multiplied by" when the multiplier follows it, and "times" when the multiplier comes before it.

Multiplied by (×)...The sign of multiplication.

Multiplier.....The number which shows how many times the multiplicand is to be repeated in an example in multiplication.

Oblong.....The plane figure formed by joining the ends of two straight lines of one length to two straight lines of another length, so that they form four right angles.

Odd Numbers.....All numbers not divisible by 2 without remainder; therefore, all numbers with 1, 3, 5, 7, or 9 in units' place.

DEFINITIONS

Order.....The place occupied by a number, as:
1st order is Units' Place.
2d order is Tens' Place.
9th order is Hundreds of Millions' Place.

Parallel.....Running in the same direction with an equal distance between.

Partial Dividends...The several dividends necessary in finding the quotient in an example in long division.

Partial Products....The several products which, when added, form the final product in an example in multiplication.

Period.....Units', Tens', and Hundreds' places when considered as a group.

Place.....The order in which a number is written, as:
Units' Place is the 1st order.
Tens' Place is the 2d order.
Hundreds of Millions' Place is the 9th order.

Plus (+).....The sign of addition.

Product.....The answer found by multiplication.

Profit.....The difference between the cost and the selling price, when the selling price is the greater.

Quotient.....The answer found by division.

Rank.....See "Location."

Receipt.....A paper showing payment or delivery.

Rectangle.....Any plane figure which is bounded by four straight lines and has four right angles.

Remainder.....The answer found by subtraction.
The part of a dividend which remains undivided in an example in division.

Right Angle.....An angle formed by two straight lines meeting in a point in such a way that if both lines were lengthened to cross each other, all four angles so formed would be exactly alike.

Roman Numerals...The numbers which are often used on watches, clocks, etc., as I, V, X, L, C, D, M.

Sales-check.....See "Sales-slip."

Sales-slip.....A paper showing the cost and quantity of merchandise purchased.

Seller.....One who sells.

Short Division.....The method of division in which no partial dividends are written.

Square.....The plane figure formed by joining the ends of four straight lines of equal length, so that they form four right angles.

Square Measure.....The table of measures used for measuring the area of surfaces.

Straight Line.....The shortest distance between two points.

Subtraction.....Taking one number or quantity from another number or quantity.

The number from which we subtract is called the "minuend."

The number which we subtract is called the "subtrahend."

The answer is called the "difference" or "remainder."

The sign of subtraction (−) is called "minus."

Subtrahend.....The number which we subtract in an example in subtraction.

Sum.....The answer found by addition.

Temperature.....The degree of warmth or coldness of an object.

Tens of Millions' Place.....The place of the 8th order.

Tens of Thousands' Place.....The place of the 5th order.

Tens' place.....The place of the 2d order.

Thermometer.....An instrument used for measuring temperature.

Thousands' Period. Thousands', Tens of Thousands', and Hundreds of Thousands' Places.

Thousands' Place.....The place of the 4th order.

Time Measure.....The table of measures used for measuring time.

Times (×).....The sign of multiplication.

Total.....See "Sum."

Unit.....One person or thing.

Units' Period.....Units', Tens', and Hundreds' Places.

Units' Place.....The place of the 1st order.

Whole Number.....A number which shows one or more units or whole things.

ABBREVIATIONS AND SIGNS

(Parts I to IV, Inclusive.)

Acre	A.	Mile	mi.
Amount	amt.	Mill	m.
Answer	Ans.	Minus	−
At	@	Minute	min.
Barrel	bbl.	Multiplied by	×
Bushel	bu.	One	I.
Cent	ct. or ¢	Ounce	oz.
Day	da.	Peck	pk.
Degree	°	Pint	pt.
Dime	d.	Plus	+
Divided by	÷	Pound	lb. or #
Dollar	$	(# written after a number)	
Dozen	doz.	Quart	qt.
Equals	=	Remainder	rem.
Fifty	L.	Rod	rd.
Five	V.	Second	sec.
Five Hundred	D.	Square Foot	sq. ft.
Foot	ft. or ′	Square Inch	sq. in.
Gallon	gal.	Square Mile	sq. mi.
Gill	gi.	Square Rod	sq. rd.
Great Gross	gt. gr.	Square Yard	sq. yd.
Gross	gr.	Ten	X.
Hogshead	hhd.	Thousand	M.
Hour	hr.	Times	×
Hundred	C.	Ton	T.
Hundredweight	cwt.	Week	wk.
Inch	in. or ″	Yard	yd.

THE MULTIPLICATION TABLES

1 × 1 = 1	2 × 1 = 2	3 × 1 = 3	4 × 1 = 4
1 × 2 = 2	2 × 2 = 4	3 × 2 = 6	4 × 2 = 8
1 × 3 = 3	2 × 3 = 6	3 × 3 = 9	4 × 3 = 12
1 × 4 = 4	2 × 4 = 8	3 × 4 = 12	4 × 4 = 16
1 × 5 = 5	2 × 5 = 10	3 × 5 = 15	4 × 5 = 20
1 × 6 = 6	2 × 6 = 12	3 × 6 = 18	4 × 6 = 24
1 × 7 = 7	2 × 7 = 14	3 × 7 = 21	4 × 7 = 28
1 × 8 = 8	2 × 8 = 16	3 × 8 = 24	4 × 8 = 32
1 × 9 = 9	2 × 9 = 18	3 × 9 = 27	4 × 9 = 36
1 × 10 = 10	2 × 10 = 20	3 × 10 = 30	4 × 10 = 40
1 × 11 = 11	2 × 11 = 22	3 × 11 = 33	4 × 11 = 44
1 × 12 = 12	2 × 12 = 24	3 × 12 = 36	4 × 12 = 48
5 × 1 = 5	6 × 1 = 6	7 × 1 = 7	8 × 1 = 8
5 × 2 = 10	6 × 2 = 12	7 × 2 = 14	8 × 2 = 16
5 × 3 = 15	6 × 3 = 18	7 × 3 = 21	8 × 3 = 24
5 × 4 = 20	6 × 4 = 24	7 × 4 = 28	8 × 4 = 32
5 × 5 = 25	6 × 5 = 30	7 × 5 = 35	8 × 5 = 40
5 × 6 = 30	6 × 6 = 36	7 × 6 = 42	8 × 6 = 48
5 × 7 = 35	6 × 7 = 42	7 × 7 = 49	8 × 7 = 56
5 × 8 = 40	6 × 8 = 48	7 × 8 = 56	8 × 8 = 64
5 × 9 = 45	6 × 9 = 54	7 × 9 = 63	8 × 9 = 72
5 × 10 = 50	6 × 10 = 60	7 × 10 = 70	8 × 10 = 80
5 × 11 = 55	6 × 11 = 66	7 × 11 = 77	8 × 11 = 88
5 × 12 = 60	6 × 12 = 72	7 × 12 = 84	8 × 12 = 96
9 × 1 = 9	10 × 1 = 10	11 × 1 = 11	12 × 1 = 12
9 × 2 = 18	10 × 2 = 20	11 × 2 = 22	12 × 2 = 24
9 × 3 = 27	10 × 3 = 30	11 × 3 = 33	12 × 3 = 36
9 × 4 = 36	10 × 4 = 40	11 × 4 = 44	12 × 4 = 48
9 × 5 = 45	10 × 5 = 50	11 × 5 = 55	12 × 5 = 60
9 × 6 = 54	10 × 6 = 60	11 × 6 = 66	12 × 6 = 72
9 × 7 = 63	10 × 7 = 70	11 × 7 = 77	12 × 7 = 84
9 × 8 = 72	10 × 8 = 80	11 × 8 = 88	12 × 8 = 96
9 × 9 = 81	10 × 9 = 90	11 × 9 = 99	12 × 9 = 108
9 × 10 = 90	10 × 10 = 100	11 × 10 = 110	12 × 10 = 120
9 × 11 = 99	10 × 11 = 110	11 × 11 = 121	12 × 11 = 132
9 × 12 = 108	10 × 12 = 120	11 × 12 = 132	12 × 12 = 144

(In these tables, the sign of multiplication (×) should be called "multiplied by.")

INDEX

Part III

Abbreviations (see Index for Part IV).
Abridged Addition, 23.
Abridged Subtraction, 39.
Abstract Numbers, 13.
Addends, 14.
Addition, 14; Sign of, 14; Carrying in Addition, 16, 20, 21; Column Addition, 22; Abridged Addition, 23; Dollars and Cents, 26.
Arabic Numerals, 93.
Austrian Method of Subtraction, 30.
Avoirdupois Weight, 85.

Bushel, 69.
Butcher's Prices and Problems, 19, 35.

Carrying in Addition, 16, 20, 21; In Multiplication, 106.
Cent, 9, 11.
Changing in Division, 120, 127; In Subtraction, 33, 36, 37.
Clock Problems, 97, 98, 99.
Coins, 9, 10.
Column Addition, 22.
Concrete Numbers, 13.
Counting Merchandise, 76.
Counting Numbers, 1, 4, 6.
Cube, 73.

Day, 95.
Definitions (see Index for Part IV).
Difference, 29.
Dime, 9.
Dividend, 55; Dividends to 99 (No Remainder), 117; Dividends to 99 (Remainders), 120; Dividends to 999 (No Remainder), 125; Dividends to 999 (Remainders), 127.
Division, 55; Sign of, 56; Table of 2's, 57; Table of 3's, 59; Table of 4's, 62; Table of 5's, 64; Table of 6's, 74; Table of 7's, 82; Table of 8's, 91; Table of 9's, 102; Written Division, 112; Changing in Division, 120, 127; Dollars and Cents, 138.
Divisor, 55.
Dollar, 9, 11.
Dozen, 76.
Drills (see topic desired).
Dry Measure, 69.

Fathom, 73.
Foot, 78.
Foot-rule, 78.
Formation of 100, 1.

Gallon, 67.
Gill, 67.
Great Gross, 76.
Grocer's Prices and Problems, 19, 35.
Gross, 76.

Half-dollar, 9.
Hour, 95.
Hundredweight, 85.

INDEX

Ice Problems, 86.
Inch, 78.

Linear Measure, 78.
Liquid Measure, 67.

Measure of Time, 95.
Merchandise Counting Table, 76.
Mile, 78.
Minuend, 29.
Minus, 30.
Minute, 95.
Multiplicand, 43.
Multiplication, 43; Sign of, 44; Table of 2's, 44; Table of 3's, 46; Table of 4's, 49; Table of 5's, 51; Table of 6's, 72; Table of 7's, 80; Table of 8's, 88; Table of 9's, 99; Tables Complete (see Index for Part IV); Written Multiplication, 104; Carrying in Multiplication, 106; Dollars and Cents, 110.
Multiplier, 43.

Nickel, 9.
Numbers—Named and Not Named, 13; Abstract, 13; Concrete, 13.
Numerals (Arabic and Roman), 93.

Ounce, 85.

Peck, 69.
Pint, 67, 69.
Plus, 14.
Pound, 85.
Problems (see topic desired).
Problems for Child to Build (Multiplication and Division), 115, 116, 136, 137.
Product, 43.

Quart, 67, 69.
Quarter, 9.
Quotient, 56.

Reading Numbers, 1, 4, 6.
Remainder, 29; Formation of, 112, 120, 127.
Review Problems, 27, 54, 87, 140.
Rod, 78.
Roman Numerals, 93.

Score, 76.
Second, 95.
Signs (see Index for Part IV).
Square, 50.
Subtraction, 29; Sign of, 30; Austrian Method, 30; Changing in Subtraction, 33, 36, 37; Abridged Subtraction, 39; Dollars and Cents, 41.
Subtrahend, 29.
Sum, 14.

Tables of Weights and Measures (see front of book); Avoirdupois Weight, 85; Counting Merchandise, 76; Dry Measure, 69; Linear Measure, 78; Liquid Measure, 67; Time, 95; United States Money, 9.
Time, 95.
Ton, 85.
Total, 14.
Triangle, 48.

United States Money, 9.

Week, 95.
Writing Numbers, 1, 4, 6.
Written Division, 112.
Written Multiplication, 104.

Yard, 78.
Yard-stick, 78

INDEX

Part IV

Abbreviations, 125.
Addend, 9.
Addition, 9; Terms of, 9; Grouping Numbers, 70, 95, 111.
Angle, 98.
Approximating in Division, 55.
Area, 96.
Average, 112.

Bills, 114.
Boiling Point, 77.
Buying and Selling, 114.

Carpeting Problems, 110.
Cent, 79.
Ciphers in Division, 37, 40, 41, 44, 50, 57, 62; In Multiplication, 18, 21, 24, 25, 27, 33.

Decade, 20.
Definitions, 120.
Degree, 77.
Difference, 12.
Dime, 79.
Dividend, 16.
Division, 16; Terms of, 16; When the Divisor is 10, 37; When the Divisor is 100, 1000, etc., 40; When the Divisor and Dividend Both End with One or More Ciphers, 41; When There Are More Ciphers in the Ending of the Divisor than in the Ending of the Dividend, 44; Long Division, 46; When the Divisor is Greater than the First Figure of the Dividend, 48; When the Dividend Contains Ciphers, 50; When the Divisor Contains Two Figures, 51; When a Two-figure Divisor is Greater than the First Two Figures of the Dividend, 53; Approximating, 55; Ciphers in the Quotient, 57; When the Divisor Contains Three or More Figures, 59; When the Divisor Contains Ciphers, 62; Table of 11's, 84; Table of 12's, 89.
Divisor, 16; 11 or 12 as Divisor, 92.
Dollar, 79.
Double Eagle, 79.
Drills (see topic desired).

Eagle, 79.

Farm Problems, 39, 58, 94.
Formation of the Period, 1.
Freezing Point, 77.

Grouping Numbers, 70, 95, 111.

Long Division, 46; Long and Short Division Compared, 46.

Merchandise Problems, 88, 116.
Mill, 79.
Millions' Period, 2.
Minuend, 12.
Multiplicand, 14.
Multiplication, 14; Terms of, 14; By 10, 18, 21; By 20, 30, etc., 24; By 100, 1000, etc., 25; By 200, 6000, etc., 27; Partial Products, 28, 31; Of Numbers Containing Ciphers, 33; Table of 11's, 81; Table of 12's, 86; Tables Complete, 126.

INDEX

Multiplier, 14; 11 or 12 as Multiplier, 92; 11 or 12 as Partial Multiplier, 93.

Oblongs, 98, 100.
Orders of Numbers, 4.

Painting Problems, 119.
Partial Multipliers (11 or 12), 93.
Partial Products, 28; Three or More Partial Products, 31.
Perimeter, 107.
Period, 1.
Problems (see topic desired).
Product, 14.

Quotient, 16; Containing Ciphers, 57.

Reading Numbers, 1, 4, 6.
Rectangles, 101.
Remainder, 12.
Review Problems, 35, 68, 91, 118.
Right Angles, 98.
Roman Numerals, 72.

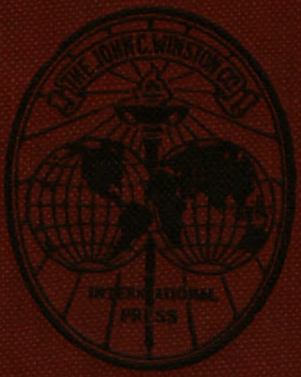
Sales-Check, 114.
Sales-Slip, 114.
Selling, 114.
Signs, 125.
Square, 98.
Square Inch, 104.
Square Foot, 104.
Square Measure, 96, 104, 105.
Square Yard, 104.
Subtraction, 12; Terms of, 12.
Subtrahend, 12.
Sum, 9.

Tables of Weights and Measures (see front of book); United States Money, 79.
Temperature, 77.
Thermometer, 77.
Thousands' Period, 2.
Time Problems, 90.

United States Money, 79.
Units' Period, 1.

Writing Numbers, 1, 4, 6.

Zero, 77.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